HELLENIC OPEN UNIVERSITY

EADTU

Proceedings

Innovating Higher Education Conference 2022

19 - 21 October 2022 | Athens, Greece

Digital Reset:
European Universities Transforming for a Changing World

Overview of papers as presented during the
Innovating Higher Education Conference 2022
19 - 21 October 2022 in Athens

Message of Athens

Open and distance universities: a strong community with a common identity
With EADTU, we form a strong community with a common identity, open to learners, open to other higher education institutions, open to governments and other stakeholders. We have a common mission in lifelong learning and digital education in each of our countries and at EU level to provide accessible, high-quality and affordable higher education for all and contribute to innovation in higher education as a whole, and ultimately, bringing European values to reality in all our societies through education.

Towards a virtual campus
Our members are leaders in digital education. They are living labs for digital innovation in their institutions and in higher education systems. Making use of the best of educational technologies, they are now moving towards virtual campuses. They teach large groups of students while ensuring lively interactions with staff and smaller 'groups of peers', getting the most out of the digital environment. By 2030, many member institutions will have scaled campuses with seamless physical, hybrid, blended and online distance spaces.

As in the past, our members will be the first ones to develop a true culture of lifelong learning: including degree, continuing and open education. They will share their experiences and expertise in a truly European context, for which we continue to organize these IHE conferences and other EADTU activities.

Microcredentials
With the Council Recommendation on Micro-Credentials, (2022), all EU Ministers of Education and Employment have engaged themselves to use micro-credentials as a tool to increase participation in lifelong learning and help achieve the target of 60% of all adults in education annually, as set out in the New European Agenda for Adult Education 2021-2030. They will offer first plans for micro-credentials to the European Commission by December 2023 and to implement them within five years.

This is an important step forward for a genuine development of continuing education and professional development in Europe. This step is important for learners of the future, necessary to generate innovative enterprises and services, SMEs, spin-offs and start-ups, and a condition to activate regional development
Our members are ready for this challenge in dialogue with national governments and thus contributing to the creation of a truly EU space for continuing education in the spirit of the Bologna Process. They will create coherent institutional qualification structures for micro-credentials. They will establish institutional conditions to enable faculties and teachers to design high-quality digital micro-credential courses and programmes.

In search of convergence
A level convergence needs to be found to make micro-credentials of different size and EQF level readable for academia and employers across Europe.

In terms of learning volume, the European Commission's Micro-Credentials Consultation Group has allowed "flexibility for innovation and experimentation, meaning that micro-credentials can range from " one ECTS to less than a full degree". This results in a broad range of possible micro-credential certifications linked to different volumes of learning and EQF/NQF levels.

To be readable and comparable, Institutional qualification structures may converge to different certification levels depending on learning volumes and level of qualification. The levels can for example range from the course level (ECTS credits are awarded) to the Common Micro-Credential Framework qualification (4-6 ECTS, European MOOC Consortium), a micro-degree (30-40 ECTS, UNED), a higher education certificate (UKOU, 60 ECTS) and probably other volumes of learning.

This is exactly what we will discuss in the next phase of the MCE (Modular Continuing Education by Micro-Credentials) project by EADTU involving 13 countries.

<u>Higher education interfaces with the labour market</u>
All this requires higher education institutions to have a new relationship with labor market actors and regions, as has already been the case with research and innovation by knowledge transfer and valorization offices.

In the field of continuing education, HE institutions are not only providers of education, but increasingly also offer an interface between the institution and the labor market, e.g. enterprises, centers of competence, knowledge and innovation communities, professional associations, and public employment services.

A dialogue with these external stakeholders leads to joint operations and the co-creation or professional accreditation of micro-credential learning opportunities. In these cases, micro-credential courses or programs may also provide specific professional credits in addition to the academic award.

Leadership and professionalization for digital higher education

Many higher education institutions have learned from the COVID crisis and are taking this as the basis for the transformation of teaching and learning in 2030 perspective. They are not going back to normal, meaning pre-COVID times.

In higher education institutions across Europe, there is a huge need for professional development of teachers and for the creation of the necessary teaching and support services to achieve educational quality levels. This starts with leadership, developing an institutional vision, strategies and frameworks for digital higher education.

The IHE2022 Conference revealed a demand of rectors and vice-rectors for peer seminars on leadership for digital higher education.
EADTU is already doing so for the middle management in member institutions. It is also organizing Deans meetings for digital collaboration and mobility involving staff and students.

To support continuous professional development on a broader scale, EADTU members in the DigiTeL Pro project have developed online courses on three main approaches to digital higher education: synchronous hybrid, blended and online distance learning.
The course material will be available as open resources on the DigiTeL Pro website to be used for professional development across Europe for teachers and teaching and learning support services.

In the framework of the OpenU project with universities and ministries in France, Germany, Spain, Portugal, Latvia and Flanders, EADTU has published eBooks on the BLOOM hub (https://bloomhub.eu/repository/) on models and guidelines for the development of digital teaching and learning in higher education, international collaboration and mobility. These are for use by single institutions and EUI alliances.

<u>Equity</u>
Based on their mission, open and distance teaching universities have always embraced the principle of equity in education. All have developed a lot of experience and expertise with regard to diversity and inclusion. The EADTU Task Force for Diversity and Inclusion was established to examine AND MAP current challenges and share solutions for a variety of topics: gender, migrants and ethnicity; Functional disabilities (the blind, the deaf,...); specific learning disabilities (eg dyslexia); prisoners; athletes artists/army staff; social inclusion (affordability of studies; poverty issues) and digital accessibility. The results of this Task Force are published on the EADTU website.

EADTU also created a Special Interest Group on E-assessment sharing institutional strategies and good practices regarding e-assessment in view of needs during and after COVID, AS E ASSESSMENT IS THERE TO STAY. The group was consisting of 17 member universities. A report on this SIG is published as well on the EADTU website

EADTU further provides services to the European Digital Education Hub of the European Commission (EDEH). On behalf of the European Commission, it organizes clinics and mentorships on digital education at the request of individual staff or individual institutions with the support of European experts. This year, it will also organize three short peer learning trajectories on synchronous hybrid, blended and online distance learning.

All this is a significant effort for continuous professional development of university staff and contributes to THE mid- and long-term strategies of universities.

EADTU especially in these challenging times will keep supporting universities European wide in their efforts to use digitalisation of education to its optimum.

Keynotes / Panellists

We would like to thank our keynote speakers and panellists for their inspiring contributions to the plenary sessions of the conference.

Theo Bastiaens

Odysseas Zoras
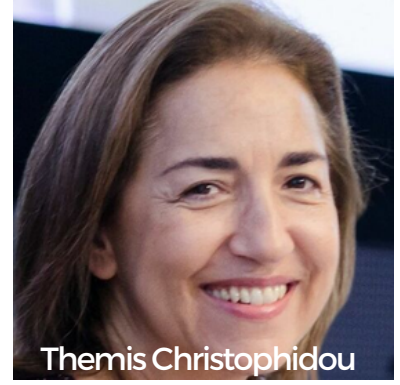
Themis Christophidou
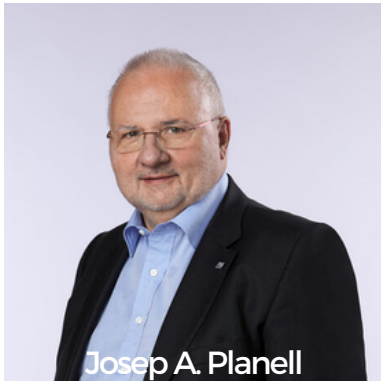
Josep A. Planell

Niki Kerameus

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Nikos Papadakis

Catherine Mongenet

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Fernando Val Garijo

Ophir Münz-Manor

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Changing the Educational Landscape: Towards Resilient European Universities

Digital courses in 21st century skills

Blended Education

Creative blended learning: students as producers of digital learning content.

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Abstract

The typical university relies on traditional strategies for knowledge transfer such as lectures in vast halls. These may be enriched with audiovisual material, but a lecture is still a passive learning process that allows a small participation by the students-listeners. 21st century students belong to the so-called digital generation, they are familiar with digital technology and at the same time have learned to receive information and knowledge through audiovisual contexts. In the social and human sciences such as literature, history, art history etc, where there are limited opportunities for hands on workshops, there is an urgent need to devise teaching strategies that allow students to be actively involved in their own learning process in addition to listening, studying and composing written assignments. At the same time, it is imperative in the 21st century society to practice composing multidimensional texts that contain text, image, audio and video.

Within this theoretical framework, composing short informative videos of 4 minutes duration is proposed, whereby using voice narration, images, music and text, students summarize the conclusions of their study on a topic related to the content of the semester course. The videos they create compose an audiovisual library within the asynchronous learning environment of the e-class, which all students can use for their study before the exams. This video library is enriched every semester so that each topic of the taught material is offered in both textual and audiovisual form. The added benefit of this practice is not only that students learn by creating digital learning content but also they practice all the required 21st century skills (communication, creativity, critical thinking, digital literacy) while the content of the e-class becomes friendlier by meeting the learning needs of each student supporting the differentiated teaching approach.

In the context of the implementation of this teaching strategy in the Department of Theatre Studies NKUA, a survey was conducted with an anonymous questionnaire of quantitative and qualitative research between the students who undertook the assignment of a written semester paper and also created the accompanying informative video. The vast majority of them positively evaluated this learning experience, also assessed it as completely creative one even though they encountered difficulties in some technical issues. In the open question, they considered the experience creative and at the same time useful for the understanding and consolidation of the content of the course, a fact that is confirmed by their high performance in the written exams. In addition, they believe that they have contributed to the study of their fellow students and feel proud that others can learn thanks to their own contribution to the e-class, the NKUA asynchronous education platform. Therefore, the usefulness of this teaching practice in terms of its learning outcomes and also its pedagogical contribution to the progress of students in the academic environment -where acceptance and self-confidence are necessary mental conditions- are highlighted.

Keywords: creative teaching, creative learning, self-confidence, collaborated learning, asynchronous distance learning

1.   Learning engagement

Which are the goals of Higher Education today? In the 20th century, universities worked very hard to build robust study programs in order to educate high qualified scientists in every field. In the 21st century, as societies, especially in the First World, move away from the industrialized economy towards the economies of services and the digital economy, our students demand from us more than knowledge; they need to develop their abilities of communication, critical thinking, collaboration and creativity. The four c's are the goal of 21st Century Education in every level, from the primary school to the University. Although that is nowadays a universal truth and it is generally admissible, many university courses, in the conventional campuses, continue to be taught in the old way: plain lectures in vast halls where students are passive listeners. How can we engage our students in their learning, especially in programs that consist of many theoretical and historical courses?

2.The mass university is dead. Long live the university for all

Mass public universities were a true revolution in the aftermath of the World War II, especially in Europe, giving the opportunity for social elevation and scientific literacy to the baby boomers. Youth in the 1950s and 1960s were born in a cultural environment where effective listening was lived and exercised; radio was still the main medium, oral reading was practiced in school, living dialogue or through telephone was a common daily situation. In addition to that, boomers were an open-air generation who lived their first decade running, climbing, discovering their natural or built surroundings. From the 90s till today, a generation is raised in a digital mediated world where the image is dominant (Morris, L.V., 2006). The brains of our students were differently developed especially those born in the 21st century, the computer natives. As a result, students are generally struggling to conquer the new knowledge and often they find our courses boring as those address only their linguistic or logical intelligence (Davis et al., 2011). Our students, raised in a lack of action and movement, face difficulties to stay still and simply listen during our class even if it is accompanied by interesting images. And in addition to that, their writing skills are still inefficient in our eyes as they are more able to organize multimedia texts as they do every day in the social media.

So, today it is mandatory to organize our teaching material and practice in a such a way that our courses could reach out not a crowd but a gathering of different persons that are entitled to a learning experience that respects their individuality. Especially after the pandemic and as the academic world now is familiarized with the asynchronous distance learning through platforms such as e-class (Greece), moodle, blogs, padlet etc, we, the educators, know that our platform can be a dynamic place where our students can find numerous and different kinds of information around our course. Although, we the teachers are the main suppliers of content in these asynchronous environments, why couldn't engage our students to be major contributors? In that way, students' work could be seen, acknowledged, corrected, distributed by other fellow students and our course could be an opportunity for collaboration, communication, creativity, and critical thinking just by shifting the point of departure from our position, as providers of learning content, to the students as creators ones (Kivunja, 2014). Towards a university that adapt to the learning needs of our students and the 21st century skills that they had to cultivate during their studies, I devised a semester assignment that demands from the students to enrich their digital skills, to collaborate with a fellow student, to critically select the content of their presentation and creatively devise a new piece of digital content for our course's e-class. Shortly, it was an integration of the digital storytelling into a cognitive framework, knowing that digital storytelling supports both the digital and visual literacy (Robin, 2008) along with the fact that is an art form (Ohler, 2013) and in that way it could be an attractive exercise.

2. Short explanatory videos make our course fun and easy

My proposal was practiced in my courses in the Department of Theatre Studies in NKUA. Its goal was to motivate my students to create digital content which will help them actively to learn the course material while they enrich the asynchronous digital class, from now on e-class, with their videos. Every paper they had to deliver in the courses "Introduction to scenography, theatre architecture and costume" and "Dress and Theatre" had to be accompanied with a 4- minute video containing still images, narration and music, a movie that can be made even as an export file from Microsoft Powerpoint Presentation. The small film had to be an explanatory video where one can find the most important information around the subject in question. Course material was divided into small parts, each pair of students chose one and studied it using reference books and other sources. Before delivering the final paper, each study group presented in class their video and after listening to class comments and suggestions, finalized their paper.

After three years (2018-2021), where dozens of videos were developed, I decided to organize a survey among my students and listen to their opinion about this practice. Students were asked to assess different values of their effort. The online questionnaire was entitled "Production of digital content" and it was built in Google Forms. It was answered voluntarily between 11 and 17 February 2022 by 32 students of the 62 that produced a video for their semester evaluation (51%). 81% said that they devised the video in collaboration with their assignment partner.

As seen in Table 1, only 4 out of 10 faced difficulties in the preparation of their videos. That's a very low number considering that in our department there is only one course about computer literacy.

Table 1: **The production process made it difficult for me/my team in the technical part**
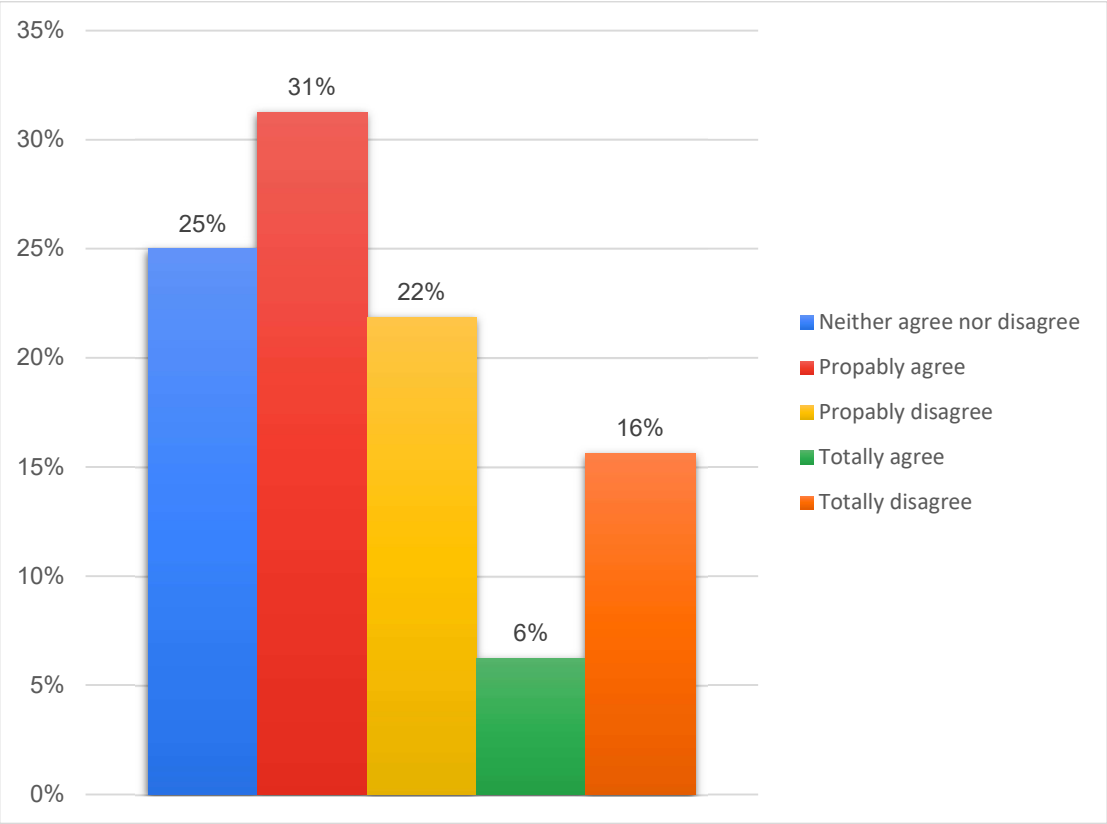
As the students said, the process of creating digital content helped a very high majority (82%) to understand the course material related to their paper (Table 2).

Table 2 **The production process helped me/my team to understand the subject of our paper**
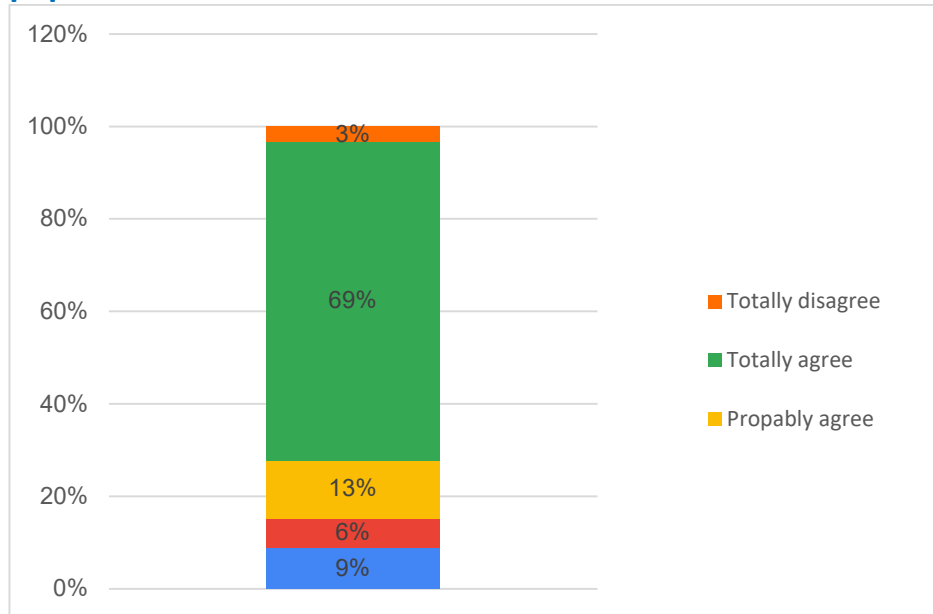
The nature of this assignment was not unfamiliar to the students, as they said that the production process was not their only opportunity in approaching digital tools. Half of them had already tried for other assignments to create small videos but a respectful number of 42% of them was forced to approach a digital creative process for the first time (Table 3).

Table 3 **The production process forced me/ my team to approach digital tools for the first time**
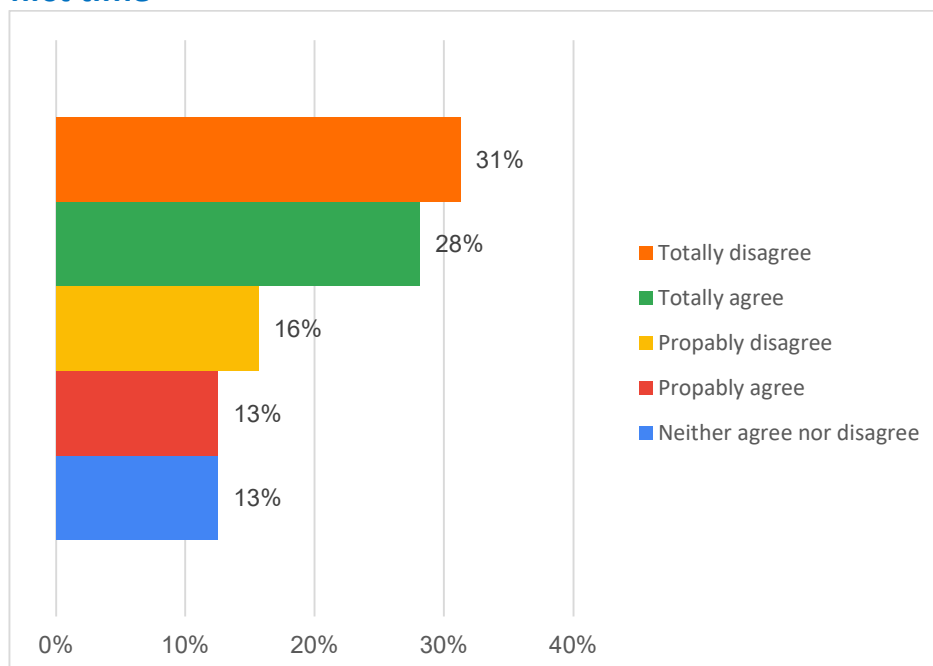
There is a totally accepted opinion: that although the assignment had its challenges (mostly in its technical aspect), not only it helped the students to collaborate with their partner but also to write afterwards their turn paper and be scientifically accurate (Table 4, 5 and 6).

Table 4: **The production process helped me to collaborate creatively with my fellow student**
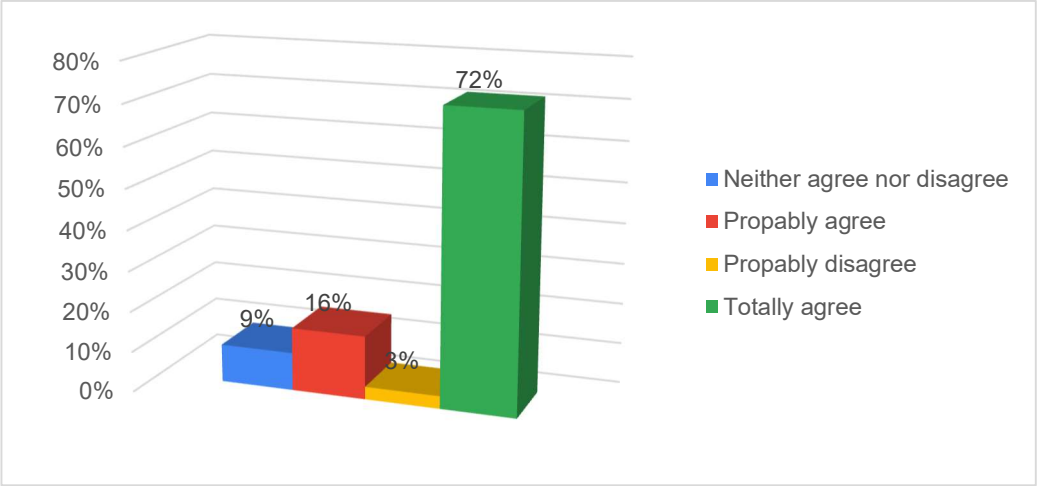
Table 5: **The production process helped me/ my team in composing our paper**
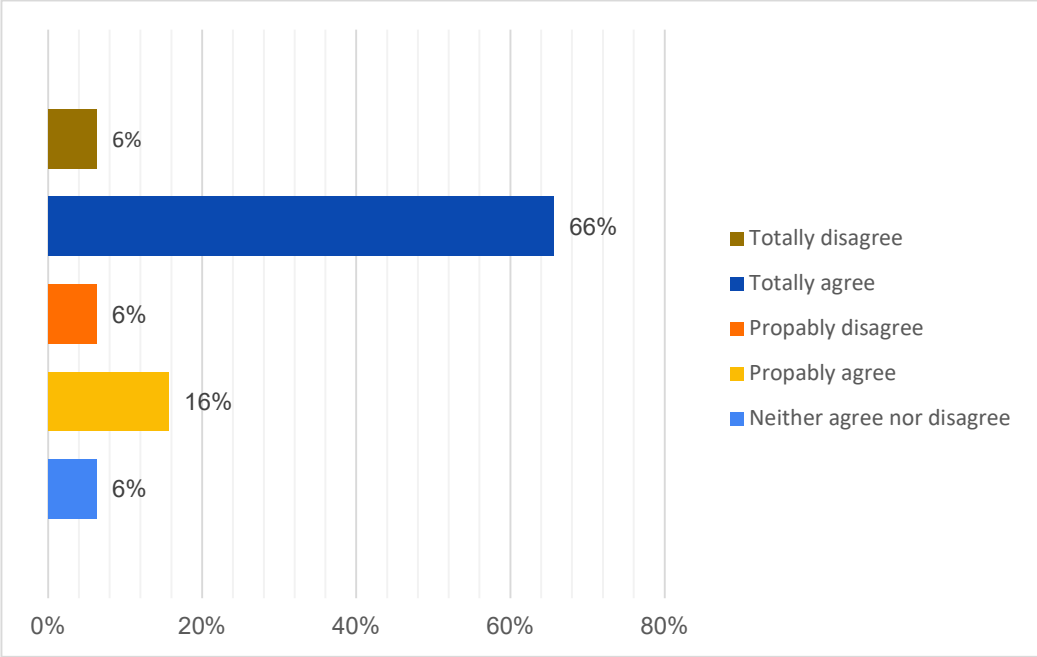
Table 6: **The production process helped me/my team check the accuracy of my/our sources**
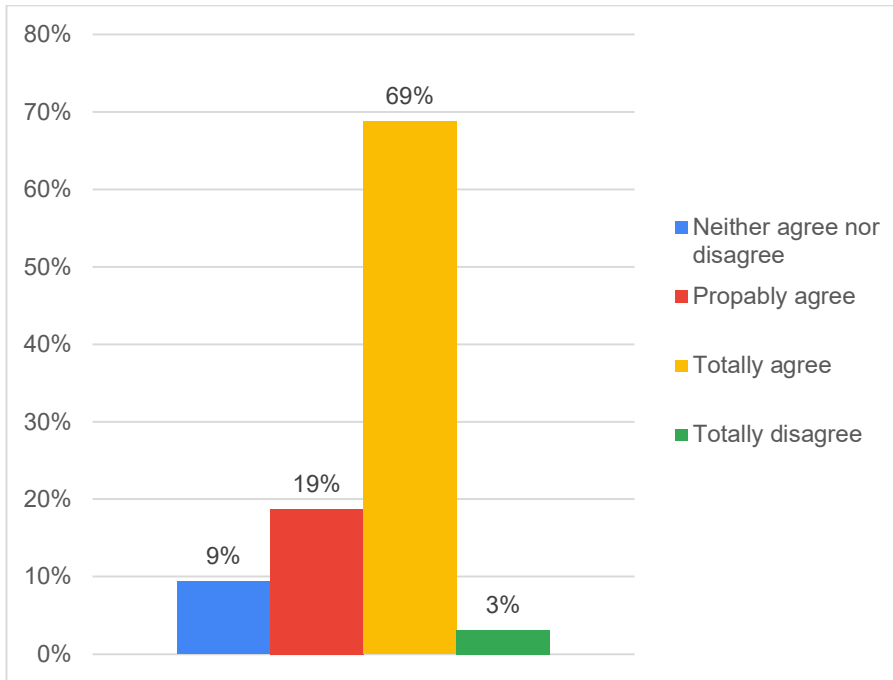
The process had its impact on their personal development as students but also strengthened the relations with each other as they answered that studying through the videos of other students was very helpful (Table 7, 8)

Table 7: **The videos of my fellow students helped me in my study**
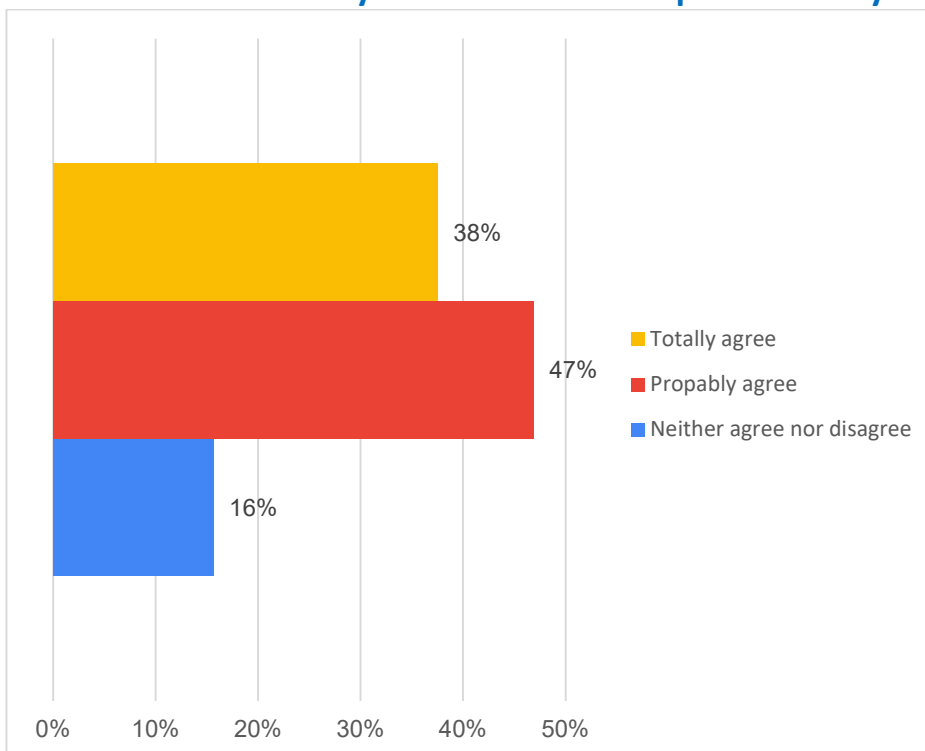
Table 8: **The videos of my fellow students difficulted me in my study**
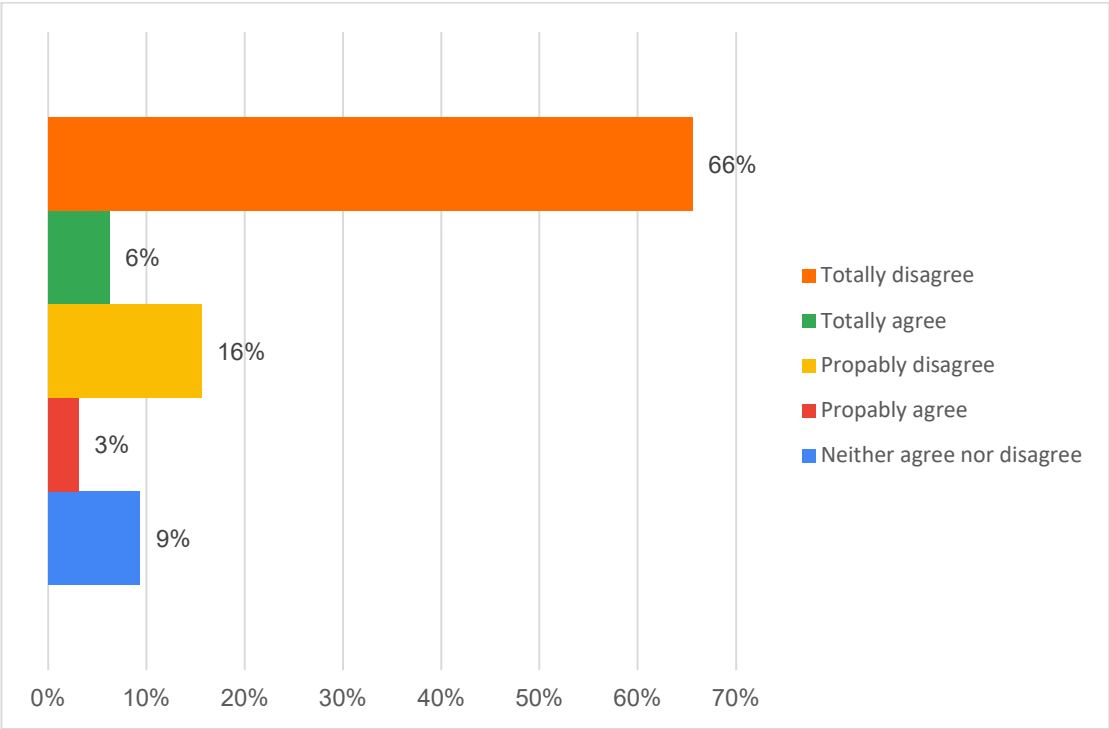
Would have been as helpful as it is now, if in the e-class were posted older written papers? The answer is no because the combination of narration and images was that made the difference as stated by 88% of the participants in the survey. (Table 9)

Table 9 **The combination of narration and images helped me understand the subjects the videos explained**
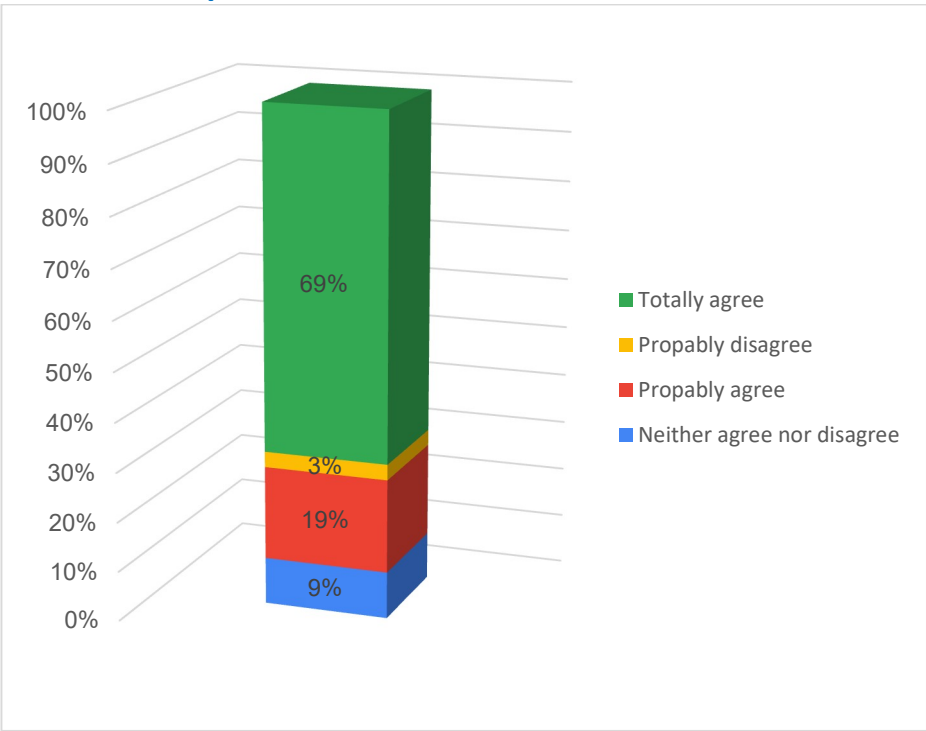
That's why they declared that they watched the videos from past years (62%, table 10) and they found useful (Table 11) for their study for the written exams that those videos were posted in the e-class (50%, Table 12).

Table 10 **I also watched the videos from past years that I found posted in the e-class**
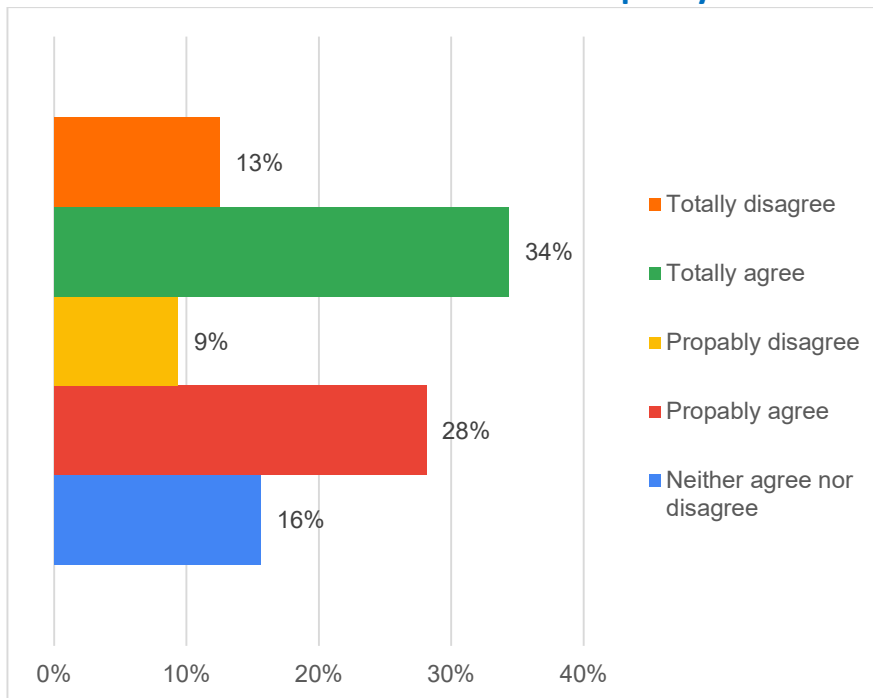
Table 11 **I considered it unnecessary to post the videos in the e-class**
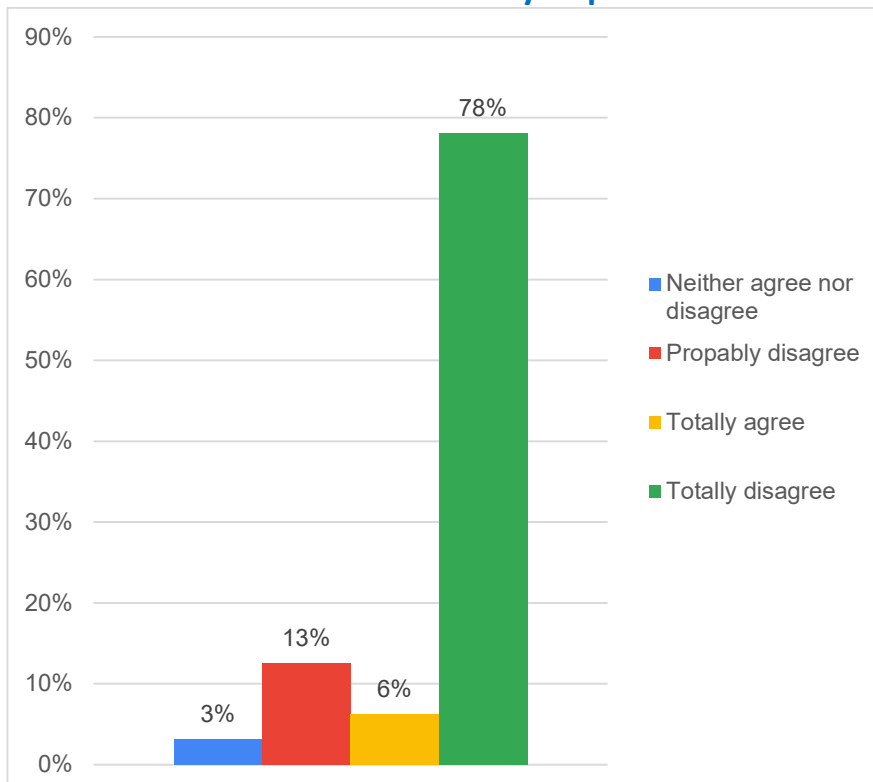
Table 12 **The digital content from past years that I found posted in the e-class also helped me in my study**
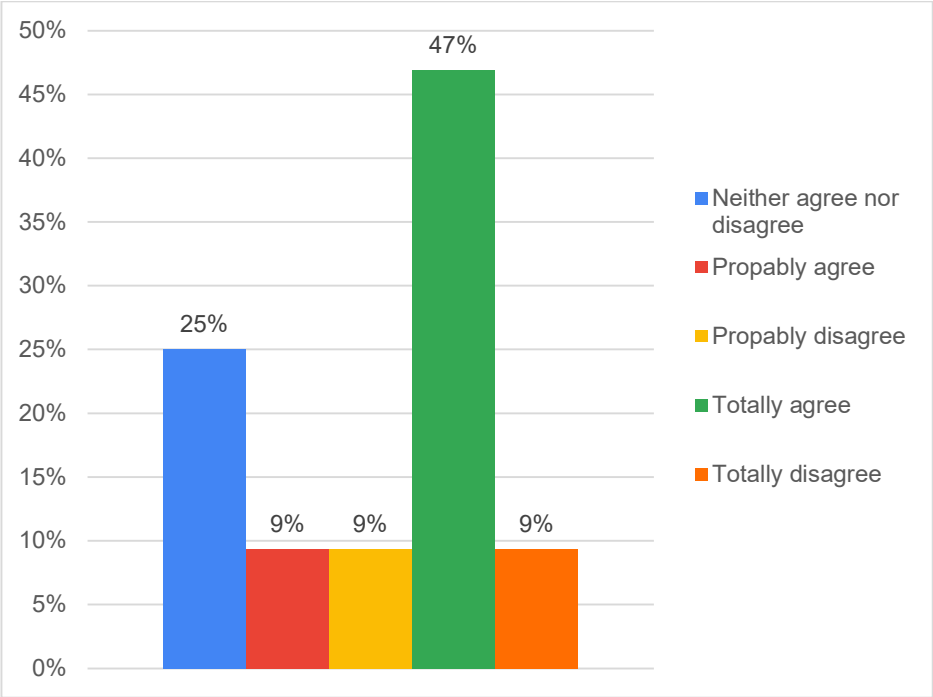
Finally and most importantly, this assignment was a source of positive feelings. Students declared they felt proud not only for themselves (Table 13) but also for their fellow students and their work (Table 14).

Table 13 **I felt proud that my fellow students were also studying through my own video**
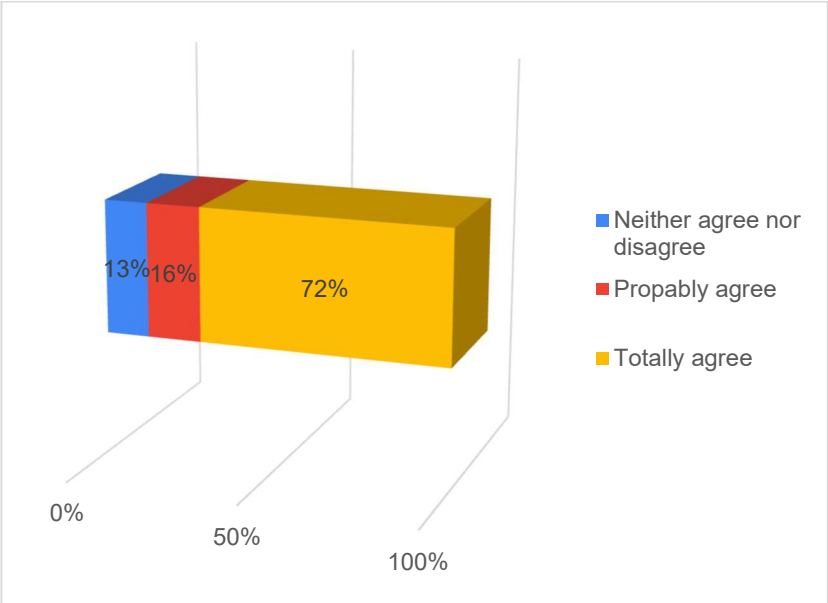
Table 14 **I felt proud for the digital content my fellow students made**
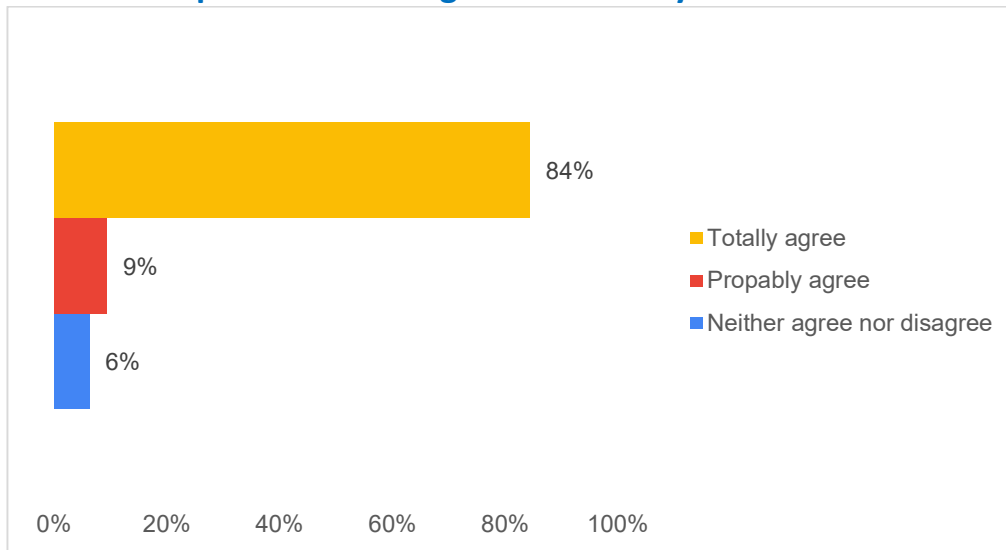
In the final open question of the survey, where they were asked to write their opinion, positive or negative, about the creation of their video, the students' replies were full of enthusiasm. The words that were continuously repeated were "creative process", "devising process", "helpful in understanding the content of the course". In particular, a female student that faced a lot of difficulties in overcoming her lack of digital skills and knowledge declared that: "Even though it was the first video we had ever made, we felt that not only our own video helped us, but also the rest of our fellow students. From now on we will have more experience and knowledge in creating such digital material and we will be able to study from two sources simultaneously written and digital. My opinion is absolutely positive."

Those positive feelings and stances respond to the findings of other prior and extended similar practices and research that concluded that motivation, reflection and metacognition are highly empowered by the production of videos as part of a learning process (Henderson et al., 2010). Also, our findings are closely enough to those of a prior in higher education student- based research (Tabor & Minch, 2013).

4. Conclusions

In a conventional university, where a lecture by the teacher or an oral presentation by the student are the typical media of a learning interaction, the production of digital content can enrich the blended learning that it is expected to be continued in the post covid era. It is shown that the production of a video is an assignment where a performative element is demanded from every student. This performative character that emerges from every student's visual and musical choices, vocal narration and the editing of the final digital content derives from the nature of the digital storytelling. Producing digital content makes our students feel creative and accepted, a fact that help them be successful in their learning outcomes. This practice, apart from been an excellent opportunity for development of the 21st skills, can be used in every possible course, no matter what its subject is, showing us that every teaching strategy should be blended with art and pathos, both in the living and the digital classes.

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Gamification in a blended exchange program

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Abstract

Teaching in higher education evolved a lot during the last years and new teaching formats became more common. Blended learning is a successful teaching method. To allow students to have an international experience nowadays the concept of blended mobility appeared. Students from Germany, Poland, Portugal, and Spain meet face-to-face and get to know each other. Then, online sessions for a few weeks are followed on a virtual campus, and finally, the students meet again in person in another country to finalize their work. This concept gives the students the chance to have an international experience without being away from home for a long time, but for two short meeting periods.

To get the students' attention the topic of the blended exchange program is Gamification. New methods are tested from students and teachers' point of view. The gamified teaching allows the students to keep motivated and the teachers to keep their teaching up to date.

Keywords: *online teaching, blended exchange, gamification, STEM*

1. Introduction

Within the Erasmus+ funded project e-CLOSE "*A model for Interactive (A)Synchronous Learning in Online STEM Education*" four European universities work together on innovative teaching methods (*https://eclose.eu*). As part of the project a blended student exchange program was conducted. Students from all universities come together for one week on-site, then have an individual online working phase and come together on-site again for one week at another university to finish their work. This whole blended workshop was based on the theme gamification. Different workshops and teaching/learning methods were used to motivate the students to study and give them the chance to be part of an exchange program.

The following paper gives a brief overview of the definition of gamification in education, then shows more details about the gamified workshops and presents a study about the acceptance of the virtual campus "*WBS LearnSpace 3D®*" among students which was used in the online phase.

2. Gamification in education

Gamification methods are adopted for techniques used for education and in professional training. Gamification in education has been a rising topic for at least seven years, because of the fast growth of publications in that

area (Swacha, 2021, p. 13). Figure 1 gives an overview of the main words appearing in the context of gamified education.

Figure 1: Word cloud combining different studies with *e-CLOSE* logo (Caponetto et al., op. 2014)

Taking a closer look in the areas that use gamification in education about 1/3 of the publications are in the field of *Computer Sciences*, followed by *Social Sciences* (about 1/4th), *Engineering* (about 1/7th), and *Mathematics* (about 1/14th) (Swacha, 2021, p. 9).

To clarify the term gamification Caponetto et al. (op. 2014, p. 53) found out that 75% of the papers use the term gamification "to refer to situations in which the learning path in its entirety is treated as a globally "*gamified*" process". Some use gamification as a term to "*relate to cases where learner interaction with a Serious Game has been integrated to some extent within a global learning intervention that is gamified*". Only nine percent of the sample used gamification as a synonym of game-based learning. (Caponetto et al., op. 2014, p. 53)

Game-based learning is a method that adopts games for educational purposes and gamification applies game mechanisms to educational interventions (Caponetto et al., op. 2014, p. 55). These two concepts remain sufficiently distinct. Both are used a lot and sometimes even combined they can nurture each other. Overall Gamification techniques are used to make learning in education more attractive and motivating. It supports the collaboration, creativity, and self-guided study of students (Caponetto et al., op. 2014, p. 55).

Nah et al. (2014) figured out eight elements of game design that are used in educational and learning contexts. Points, levels, badges, leaderboards, prizes, progress bars, storyline and feedback are the main elements. The point system allows teachers to measure the success of the students. In an academic context they can be considered as credits also. Secondly various levels/stages allow learners to get a sense of progression in the game. With each stage the level of difficulty rises, so students increase their skills with each level. Thirdly badges are another element. They are rewarded when a task is accomplished and motivate the learners to keep engaged in the classroom. Badges also inspire learners to work towards future goals. Furthermore, leaderboards are used to show the current high scorers of the game. Students' sense of eagerness and competition is risen by that and is one of the most motivating elements for learners. Prizes and rewards are another element which is effective to motivate learners. Additionally progress bars are a commonly used element in educational games. They display the current learning progress and motivate students to achieve their educational (sub-)goals. If a student is falling behind in his learning progress, progress bars can encourage him to continue learning. Another element which helps to keep students interested during the learning process in the game is a storyline. The game should be narrative and helps students to transfer the learned subject into real-life. Especially for problem solving activities a storyline is useful to keep students motivated. Finally, feedback is the last element which increases learner engagement. It is important to give frequent and

immediate feedback because it has a greater influence on the learning effectiveness and keeps the students in the flow state. (Nah et al., 2014)

Overall, Gamification methods increase the student's motivation (Hassan et al., 2021; Monterrat et al., 2015), even though "*a big effort is required in the design and implementation of the experience*" (Domínguez et al., 2013, p. 391).

3. Workshops with European partners

3.1 On-site training in Poland

For 5 days students took part in activities with STEM (*which stands for: science, technology, engineering and mathematics*) teachers at the Technical University Lodz (teachers from partner universities could be also involved); new didactic methods and IT tools were implemented. These methods and tools included: individual work (e.g., presentations, mini PBL), teamwork (e.g. jigsaw, STAD), discussions (e.g. fishbowl), learning insights (e.g. high five). The figures 2 to 4 show some photos of the workshop week in Poland.

Figure 2: Students working with electronic whiteboards

Each day, students had one morning and one afternoon session. At each session, they were introduced to one method/tool. The topics of the days were the following:

- **Day 1** Short challenges. Discovering some solids and surfaces – GeoGebra and AR to visualize them
- **Day 2** Introduction to mern app development
- **Day 3** Theory of Inventive Problem Solving
- **Day 4** Applicability of various active learning methods in engineering
  A large variety of different active learning methods was used on day 4. Design Thinking, a kind of jigsaw combined with pantomime/sketching, a quiz and various kinds of brainstorming methods were used on that day.
- **Day 5** Games that can be used in a language class
  Day 5 of the event was all about language games. Students had hands-on practice with them. In a project team activity (the main task of the day), they also designed their own game focusing on the DT persona and ideation. The game was then presented and assessed by other peers playing the role of

end-users. Word, Picture, and People SMARTS were awarded to those of the teams that were most successful with language use, visuals, and people/communication skills.

Figure 3: Selection of teams

On the fifth day, a summary session was organized, during which students gave feedback through whiteboard sketches on the usefulness of each of the gamification methods presented during the training in Lodz.

Figure 4: Student presentations of their work

During the week, students were included in the city game, which allowed them to get to know the university campus and the city of Lodz better.

3.2 Online training with all partners

The on-site training in Poland was followed by online learning activities conducted via *WBS LearnSpace 3D®* to continue the gamification process before the next meeting in Germany. Students used the virtual campus to hold meetings for their group work. They held individual meetings within their groups and could also ask a teacher who was available at that time to join. Figures 5 and 6 show the auditorium and the terrasse next to it on the virtual campus. The task was to prepare a presentation about a tool that they would like teachers to

use. This method can be seen as a reversed teaching method because students present their ideas and tools that teachers should use in class. In this case the teachers were the learners.

The virtual campus was used during the whole project with several classes. Later in the paper you can read more about it.

Figure 5: Student presentation in the auditorium of the virtual campus

Figure 6: Simulation class in the virtual campus

3.3 On-site in Germany

The on-site gamification workshop in Saarbrücken, Germany provided a space with new activities and a scope to discuss online activities and distinguish the leaders of the entire process.

During 5 days in Saarbrücken, students took part in activities with teachers from the University of Applied sciences Saarbrücken; new didactic methods were implemented. These methods and tools included: individual work (e.g., presentations), teamwork, discussions, learning insights.

The whole week had the topic "*Develop your own wind turbine to produce hydrogen*". The days were structured as follows:

- **Day 1** Introduction and building teams, presentation of online work
- **Day 2** Lectures about the theory of *fluid dynamics*
- **Day 3** Wind turbine workshop (construction of axial wind turbines)
- **Day 4** Hydrogen production, preparation of presentations
- **Day 5** Presentations, awards

Figure 7: Winning team of the wind turbine workshop

During the five workshop days students learned in some lectures the basics about windmills and fluid flows. On the next day students had to draw and then construct the blades themselves. Wooden materials as well as different foils were offered, and students could decide on their own which material they wanted to use and how they shaped their blades. They saw, cut, hone down, glue the materials and in the end, they had to have three blades done. On the next day the windmill with their blades was connected to a hydrogen cell and a constant wind turbine was switched on in front of the mill. The amount of hydrogen production was measured, and the winning team was awarded a trophy. The winning team with their blades can be seen in Figure 7.

Figure 8: Students presentation of their construction idea

As a social program during the week students did a treasure hunt with the app actionbound. The students divided into groups and each group used one smartphone. They had to fulfill different tasks like taking a selfie, singing a song etc. to unlock the hint to explore the next sight of the city.

On the fifth day, a summary session was organized, during which students held their final presentations as in figure 8 and gave feedback on the workshop. Figure 9 shows all students and teachers involved in this gamification workshop. Students are holding their own built blades.

Figure 9: Teams of the wind turbine and hydrogen production workshop

4. Evaluation of the Virtual Campus

As described in chapter 3.2 during the project and especially for the online part between the two on-site workshops, students and teachers used the virtual campus from *WBS Learnspace 3D®*. A survey was conducted among students to find out how the students dealt with the software. For this the *Technology Acceptance Model* (TAM) is the most widely used model to study the acceptance of technology and it was adapted from Briz-Ponce et al. (2017).

Unfortunately, no significant results were found because only 52 students participated in the survey. Nevertheless, the following main results were made.

The survey was answered by 58% male students and 42% by female ones. Students from all partner universities of the project participated in the survey (University of Alcala 31%, University of Aveiro 23%, TU Lodz 19%, htw saar 27%).

Questions of seven different categories were asked. For the questions of Perceived Usefulness, a large group of students was undecided whether they agree or disagree. "*I would find the system useful in my job*" scored the best with 40% positive answers. The Perceived Ease of Use was answered positively by more than 65% of students. "*Learning to operate the system is easy*" and "*the system is easy to use*" got over 72% acceptance. The Attitude towards the virtual campus was great as well. 3/4 of the students agreed with the sentence "*Working with the system is fun*". Half of the students were more or less satisfied with the program and another 30% were undecided (Perceived Satisfaction). For the Interactivity questions, more than 50% of the students said they disagree with "*it is easier to interact with students/teachers than in reality*". Students felt comfortable in the virtual world (65%), and only 38% feel immersed in the virtual environment (Virtual Reality). For the last

block about the Learning Environment 40% were undecided, but "*the use of metaverse improves online teaching*" was agreed to by 49% of the students.

As the survey showed the students overall accept the use of the virtual campus and think very positive about the use of the system, even though it cannot keep up with the real campus, because the interaction and contact in real life is closer.

5. Conclusions

This paper has shown that the blended mobility module gave students the chance to meet with international fellows and experience a gamified workshop which motivates to learn and to work in teams. This exchange program of the e-Close project was a success and can be seen as an inspiration for other international university networks to implement this blended exchange format.

The blended exchange program (on-site experience in one country, online working phase in between and on-site experience in another country) gives all kinds of students the opportunity to get to know other countries/cultures, work in international teams and broaden their learning experience in a short time. Virtual campuses are fun to use and help to bring students and teachers from different universities together.

Finally gamified education helps to increase the student's engagement and motivation.

6. Acknowledgement

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Online and Distance Education

EADTU I*HE2022 Hellenic Open University Conference, Innovating Higher Education 19 – 21 October Athens, Greece

Activating academic distance education, some empirical results about a new approach of the Open Universiteit (OUNL)

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Abstract

Between 2014 and 2018, Open Universiteit (OUNL) rigorously transformed her educational approach in all courses by introducing a new model of activating distance education with an emphasis on degree programs instead of individual courses and with the introduction of more structure and social and academic integration. In September 2014 all master's programs (60/120 EC) and between 2016 and 2018 all bachelor's programs (180 EC) were being taught in the new model. This transformation, presented by Schlusmans, Van den Munckhof and Nielissen on the OOFHEC 2016: *Active online education: a new educational approach at the Open Universiteit of the Netherlands* introduced many changes from the perspective of the student, the lecturer, the student counselor and other support staff. These changes can be divided into four categories:

(1) changes with respect to the intake (such as introduction of an intake with a student counselor, strict entry requirements in the master's programs comparable to other Dutch universities, and design of a study plan);
(2) changes in the organization (an academic year was introduced, courses with fixed course schedules, exams at pre-arranged times, no automatic renewal of registration, no additional exams, deadlines within the course);
(3) changes with respect to the social and academic integration, such as more contact with lecturers, more meetings with fellow students and more collaborate learning;
(4) and changes in the didactic approach (e.g. active monitoring of the student, online and activating learning, more assignments and feedback).

In this paper, we use information from surveys amongst students, alumni and lecturers, administrative data about OUNL students, and information collected via focus groups to present empirical results about these changes. We concentrate on three effects: study pace, satisfaction and dropout. Our findings suggest that dropout rates did not change that much. However study pace did increase: students achieve more EC per year. Student satisfaction was already high at OUNL before 2015 (amongst the highest compared to the other Dutch universities) and has remained high since. These and other results presented below have been discussed within OUNL to see to what extent the various aspects of the new educational model are implemented. This has led to further refinements (Open Universiteit, 2022a).

Keywords: quality assessment in higher education, study success, activating distance education

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1. Introduction

The Open Universiteit participates every year in the Dutch Student Survey (NSE), which determines (among other things) how satisfied students are with the education they follow at their university. The most recent measurement in 2021 shows that OUNL students are highly satisfied with their study program (Van den Munckhof et al., 2021a, 2021b, 2022). Bachelor's students score an average of 4.1 on their education (on a scale of 1 to 5) and master's students 4.0. These scores are slightly lower than before the introduction of the New Educational Model (NOM), when both bachelor's and master's students scored an average of 4.3. In the intervening years 2015 to 2019 (there was no NSE in 2020) the scores varied between 4.1 and 4.2, so there is a large degree of stability 'overall'.

When we look in more detail at student satisfaction with the study program in the sixteen bachelor's and master's programs of OUNL between 2014 and 2021, we see more variation. With one exception, no study program in any of these years shows a lower average score than 3.5, the standard used by OUNL as a lower limit. In this seven-year period, the computer science master's programs vary the most (3.3 – 4.6) and management the least (4.0 – 4.2). Between 2014 and 2021, the most variation can be seen in information science (4.0 – 4.7) among the bachelor's programs and the least variation in humanities (4.2 – 4.4). The somewhat larger variation in computer science and information science is probably also the result of the smaller numbers of students in these fields of study.

In recent years, students are generally very satisfied with the content of the various courses, the connection with current developments, teaching methods and the coherence of the curricula. The degree programs meet the expectations of most students in terms of difficulty and many students would recommend others to study at the OUNL. Students rate the expertise and explanation of lecturers as excellent, but do see opportunities for improvement in the supervision by lecturers, for example with regard to feedback on assignments, tests and reports.

The degree of bonding, an important factor with respect to study success (Hausman et al., 2009; Leest et al., 2022) varies when we look at bonding with the university respectively the study program, the regional study center (there are seventeen in The Netherlands and Flanders) and other students, as table 1 shows.

Table 1: Bonding with university, study program, regional study centre, other students, 2021

	University		Study program		Regional study centre		Other students	
	Bachelor	Master	Bachelor	Master	Bachelor	Master	Bachelor	Master
% Moderate and high sense of belonging	65%	63%	75%	76%	43%	22%	24%	42%
Mean score	2,7*	2,7	2,9	2,9	2,3	1,8	2,0	2,3

*) On a 1-4 scale: 1=not connected, 4 = strongly connected

Students feel most connected to the study program and the degree of bonding with OUNL is high. The degree of bonding with the regional study centers and with other students is considerably lower and bachelor's students in particular feel little connection with their fellow students.
Student satisfaction and feelings of belonging are important indicators. Passing or failing a course exam, obtaining or failing to obtain a diploma and study pace are also relevant to see whether the

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interventions carried out by OUNL since 2013 were successful. The period since the introduction of a new educational model (in 2014 in the master's programs, in 2016 in the bachelor's programs) suffices to observe possible effects, although exact effects cannot be determined. After all, the interventions were often introduced simultaneously or to a large extent overlapping each other. This is often the case in Dutch higher education where interventions to improve study success seldom are accompanied by a serious research design to measure effects (Leest et al., 2022).

2. Changing the educational model of OUNL in 2014 to improve study success

OUNL is the open distance teaching university of the Netherlands, founded in 1984. In recent years, the number of students increased rapidly. From 14,244 students in 2018 to 17,015 in 2021. This increase can at least partially be explained by the firm reduction of tuition fees and the extension of student subscription rights. Both were the result of nationwide 'Covid-19-policy' introduced since 2020 in higher education.

For a long time OUNL philosophy has been to provide higher education for self-directed adult students who could decide for themselves what, where and how to study. There were no entry requirements, there was no academic year and students could start studying whenever they wanted and write the exams when they felt they were ready for it. There was no other distance teaching university, which offered such a degree of freedom to her students (Van den Boom et al., 1989). In 'the eighties' openness for all groups of students was key and study success and student retention were only minor concerns. In the first decade of this century, however the reduction of student dropout and the increase of academic success came to figure much more prominently on the educational policy agenda's. Reducing dropout became one of the key strategies in Europe (Vossensteyn et al, 2015). In the Netherlands dropout rates became part of systematic monitoring (Wartenbergh et al., 2008; Van den Broek et al., 2021).

In comparison with the other public universities in the Netherlands OUNL did not perform very well with respect to study success: two thirds of the thousands of students that start studying at the OUNL each year has the intention to obtain a bachelor or master's degree, but less than 15% actually got their diploma (Open Universiteit, 2012). In its institutional plan 2012-2016, the OUNL therefore stated: *"Our success rate can and must be improved and the traditional model of independent self-study is not sufficient anymore to serve this goal"* (Open Universiteit, 2012, p. 5). The educational approach was renewed. In this paper, we report on this renewal. We describe the new model and report on several evaluation studies that were carried out between 2014 and 2022.

Although the explanation for study success is complicated, research shows that student-related factors are mainly responsible for academic success (Schlusmans et al., 2016b; Delnoij, 2022; Leest et al., 2022). Student characteristics include personality traits, intelligence and personal circumstances such as family life and work load. This was also evident from the annual OUNL student survey (Van den Munckhof et al., 2012, 2013): students who dropped out gave a variety of reasons which mainly relate to personal circumstances, such as lack of time to study (in conjunction with parenting, work and other commitments) and life events (ill health of self, partner or children, moving house, divorce etcetera). Only a few students mentioned institutional factors such as too much freedom, too little support and too little contact with fellow students. Next to this group, about one third of the active students had actually thought of quitting because of the slow progress in their studies, which had a

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very negative effect on their study motivation. When asked what made them stay, they contributed this to personal characteristics and to the fact that they have already made many investments (in both time and budget). Only very occasionally, students mentioned an action from OUNL as a reason to persevere.

The picture that emerged from these studies ten years ago corroborates the findings at other distance teaching institutions (Simpson, 2012; Powell, 2009) which stated that academic success is largely the result of a combination of factors outside or mainly outside the sphere of influence of the institution. However, this should not prevent a university to take action. When the new educational model of OUNL was designed, several potentially relevant measures were combined to improve study success (see figure 1).
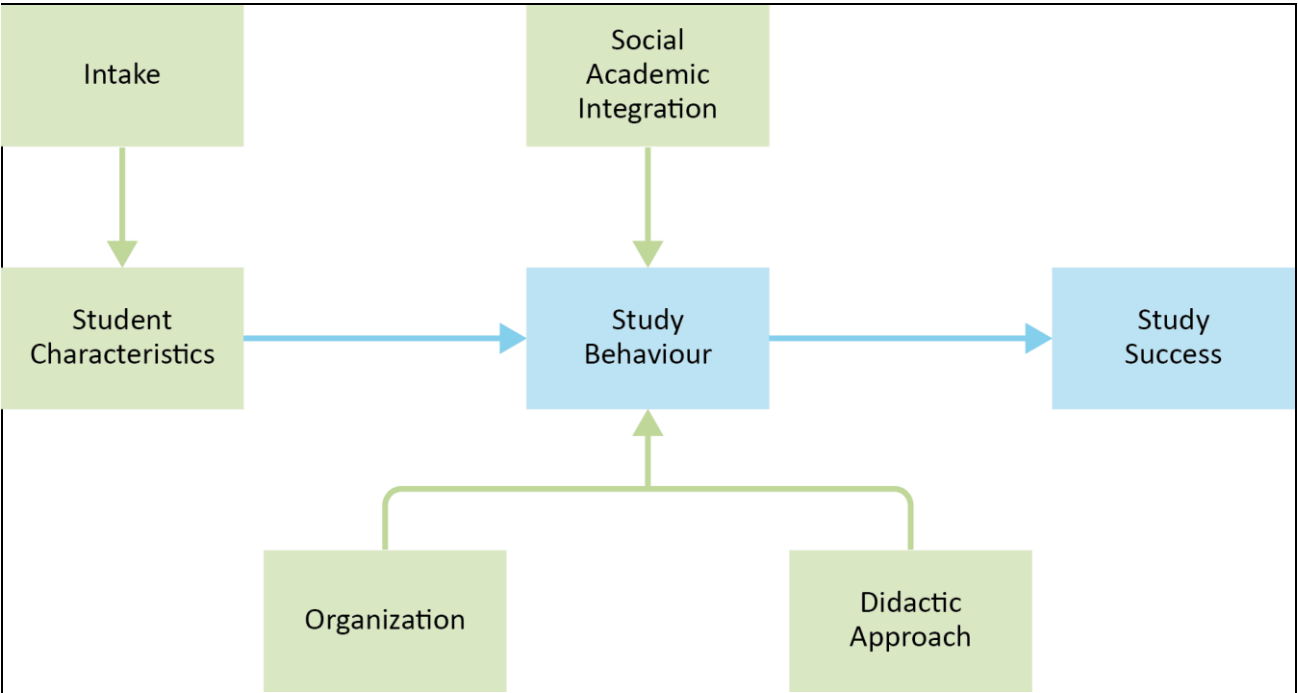
Figure 1 A model for improving study success (Schlusmans et al., 2016b)

In this model, student characteristics are most important for study success. These characteristics as such cannot be influenced by the institution, but the *study intake process* can play an important role in the self-selection of students and in their study choice (Simpson, 2012, Schlusmans et al., 2016b). An important part of the intake is clarifying the expectations for which the use of a voluntary assessment procedure before inscription can be useful (Delnoij, 2022).

The second factor is the *organization of the program*, which can lead to the reduction of non-commitment by setting deadlines and providing structure. In addition, the reduction of parallel programming of course modules, the even distribution of the study load over the academic year and the monitoring of student progress will contribute to more successful study behavior.

The third factor is *social and academic integration*. Regular contact with the lecturers and the sense of belonging to the academic community are crucial. Social integration is the extent to which students feel at ease among students and lecturers and feel connected. Any form of academic and social

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bonding contributes to improved academic achievement and to an increase of the degree of goal orientation (Severiens et al., 2009). This in its turn influences the decision either to dropout or to continue (Tinto, 2009). The relationship between academic integration and study success has been demonstrated in a number of studies (Ulriksen, et al., 2013) that stress the importance of contact with lecturers about the subject matter, discussions with fellow students and participation in academic activities as factors related to study success.

The fourth factor is the **didactic approach**: the quality of the teaching materials and the testing are important for academic success. There is an optimal ratio between self-study and contact time (Schmidt et al., 2010). A limited contact with lecturers and other students will motivate students to study independently but too much contact will take up time, which could be used for self-study. Also the use of activating teaching methods (Zhou, 2012), formative types of tests and the use of partial exams (Bruijns, 2014), and collaborative learning (Herrera-Pavo, 2021; Janssen et al., 2020) will contribute to study success.

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3. The new educational model in 2013: activating distance education

OUNL formulated an evidence-based educational model which would increase study success (Koper et al., 2013) by intake interviews to clarify expectations, reduction of non-commitment by introducing an academic year and a course schedule with fixed deadlines, increase of social and academic integration by organizing more virtual classrooms, more face-to-face-meetings, a pro-active lecturer and a study counselor, more activating teaching methods, more working in groups, regular formative tests and partial exams. In the table below all the measures are summed up (Schlusmans et al., 2016b).

Table 2 The new educational model of OUNL (2013)

Factors influencing study success	Actions/measures
Intake	Intake with a student counselor Strict entry requirements comparable to other universities Design of a study plan Information about the level of the study and the amount of study time necessary
Organization	Introduction of an academic year Courses with fixed schedules in the master's programs Courses with a combination of fixed and flexible schedules in the bachelor's programs Exams at pre-arranged times No automatic renewal of registration No additional exams Deadlines within the course Active monitoring of the students
Social and academic integration	More contact with lecturers Introductory and face-to-face-meetings Virtual classrooms More group work
Didactic Approach	Online learning Activating learning Assignments and feedback Study load more in accordance with EC

The new model was presented in May 2013 and projects were set up to transform all the degree programs, including training of staff and changing many administrative procedures. In September 2014, the first master's students started studying in the new model and in September 2016, the first bachelor's students began.

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4. Evaluation of the new educational model: study pace, satisfaction and dropout

With the introduction of the new educational model, an evaluation program was set up to answer questions such as: how many students will enroll for the programs? Does the model lead to more study success on the course level and on the program level? Are students and staff satisfied with the model and what can be improved? The new administrative procedures were very different from the former ones, so it was difficult to compare the old and the new groups of students. Nevertheless, OUNL defined several reference groups of students for the old system (Schlusmans et al. 2016b). In this paper, we concentrate on the following effects: study pace (in terms of European Credits, EC, par. 4.1), satisfaction (par. 4.2) and dropout (study stop without degree diploma or course certificate, par. 4.3). We have selected from studies earlier presented in Dutch (Schlusmans et al. 2018 and Van den Munckhof et al., 2021a, 2021b, 2022) and both use qualitative measures from focus groups and the analysis of open questions and quantitative indicators.

4.1 Study pace improves

4.1.1 Master's students

The number of EC a student earns in a year measures study success on program level. In table 3a, the amount of EC the students earned on average was calculated for each cohort separately. We also looked at a comparable group of students studying in the former educational model (table 3b). Results are reported when a group consists of more than seven persons. Table 3 shows that compared to the reference group a considerable increase per year takes place in most of the master's programs. After two year study the mean amount of EC increases from 22 to 37. The programs Psychology and Humanities show figures with a smaller amount of EC after one, two and three years of study compared to the reference group 2013-2014, but this decrease is much smaller than the increase in the other seven master's programs.

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Table 3a Study pace: mean number of EC per year in master's programs New Educational Model 2014-2021

	After 12 months*		After 24 months		After 36 months	
	Mean	N	Mean	N	Mean	N
Master Business Process Managem. & IT (MABPM)**	25	1150	43	867	46	488
Master Computer Science (MACS)	16	31	34	21	47	16
Master Environmental Sciences (MAES)	10	144	17	98	24	60
Master Humanities (MAKC)	10	245	23	167	30	122
Master Management (MAMAN)	22	2466	38	1763	40	923
Master Educational Sciences (MAOW)	25	532	38	383	45	246
Master Psychology (MAPSY)	16	718	29	465	36	292
Master Law (MAR)	21	812	37	539	43	338
Master Software Engineering (MASE)	19	232	32	179	39	128
Total	**21 EC**	**6330**	**37 EC**	**4482**	**41 EC**	**2613**

*   *Students who have been registered for at least 12 (24, 36) months
    and whose registration rights have ended in the first 6 months.*
** *between brackets the labels of the several disciplinary master's programs.*

Table 3b Study pace: mean number of EC per year in master's programs in the Former Educational Model (reference group) 2013-2014

	After 12 months		After 24 months		After 36 months	
	Mean	N	Mean	N	Mean	N
MABPM	11	235	22	56	29	49
MACS	12	29	24	7	37	7
MAES	12	44	12	8	21	8
MAKC	14	155	25	40	32	32
MAMAN	9	562	16	260	24	207
MAOW	9	62	19	10	23	9
MAPSY	17	612	30	117	41	96
MAR	19	506	28	29	33	80
MASE	16	29	26	16	36	14
Total	**14 EC**	**2298**	**22 EC**	**609**	**30 EC**	**502**

Figure 2 shows the increase of study pace from another perspective. The time to pass the master's exam is on average much shorter for students in the new model (figure 2, red) than for those in the reference group (in blue). This also holds true for the master's programs Psychology and Humanities.

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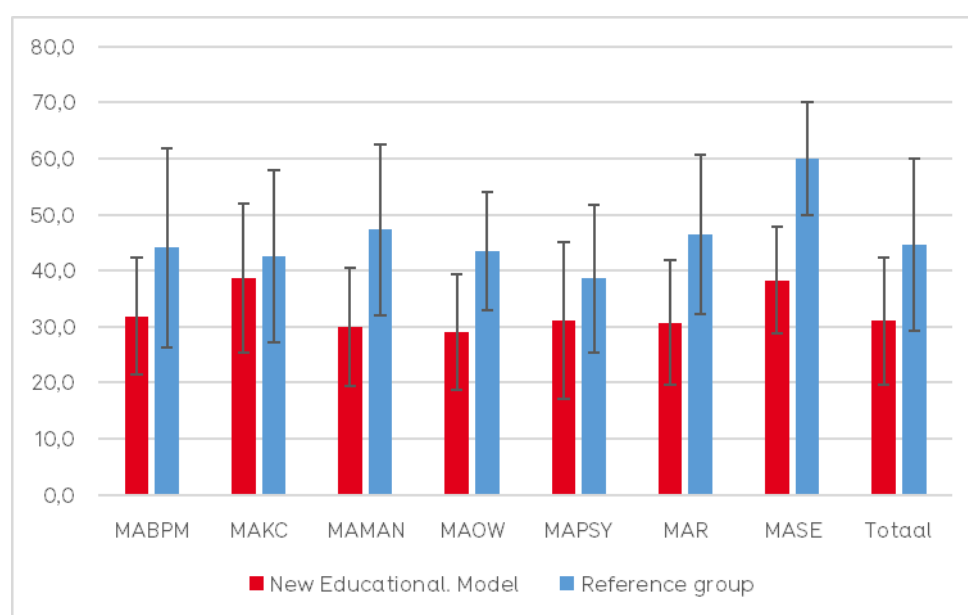
Figure 2 Time to pass the master's exam (in months)

After three years, almost half of the master's students have graduated. The gain in study pace from the first year decreases in the second year and when the master thesis is written.

In table 4, we see large differences between the various programs. More detailed analyses (not reported here) of the duration of the thesis, which is usually the final part of the degree program, show that the new educational model has had little or no effect on this part of the degree programs.

Table 4 Proportion of master's students that pass their master exam within three years of study

Cohort	MABPM		MAKC		MAMAN		MAOW		MAPSY		MAR		MASE	
	G*	R	G	R	G	R	G	R	G	R	G	R	G	R
2014	58%	0%	-	-	67%	0%	60%**	0%	67%	0%	71%	0%	75%	0%
2015	71%	3%	36%	18%	63%	6%	53%	7%	68%	2%	77%	2%	52%	7%
2016	68%	2%	31%	23%	52%	10%	73%	7%	63%	12%	58%	10%	42%	17%
2017	62%	15%	37%	13%	53%	14%	73%	12%	59%	15%	61%	14%	34%	22%

G = pass exam. R = did not pass, but still have subscription right to do exam.
*** Percentage in grey if less than 30 students.*

We have also looked at another indicator of study pace, not on the level of the degree program, but on course level: the proportion of students who get a course certificate within a year. As a reference group, we selected the students in all master courses in 2013. The average proportions of students who got a course certificate within a year are reported in figure 3.

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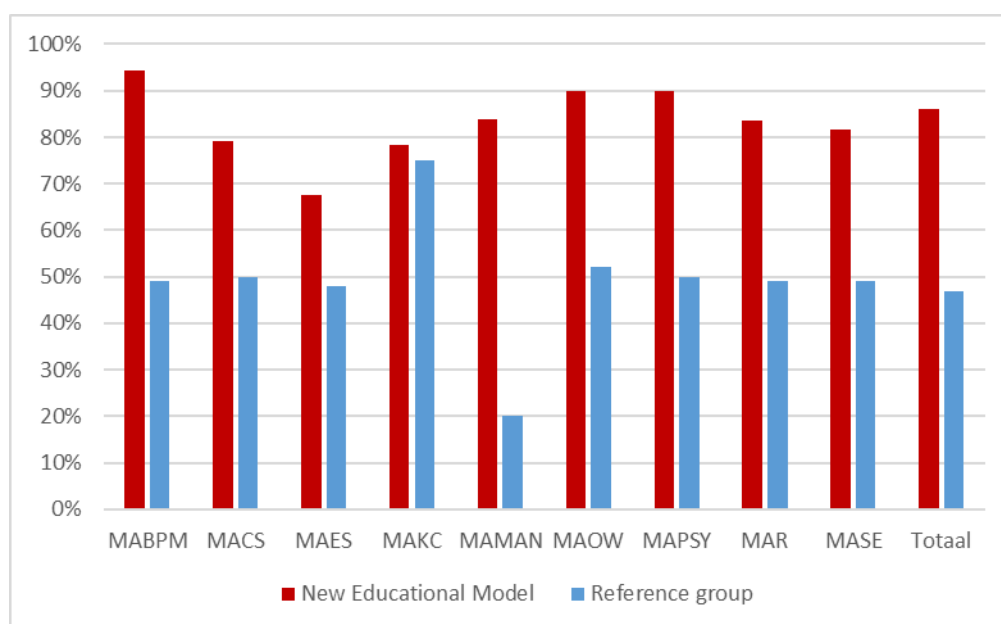
Figure 3 Proportion master's students passing their course exam

We conclude from figure 3 that the introduction of the new model has led to a substantial improvement in course results. The exception is humanities (MAKC in figure 3). Here we notice only a slight increase. This can be explained by the fact that humanities already offered a rather structured approach in 2013 for its master's courses and already scored a high percentage in 2013.

4.1.2 Bachelor's students

How about study success in the bachelor programs? Comparing the amount of EC students achieve in the first year for the reference group and the group studying in the new educational model, we notice a higher amount of EC achieved in the new model. Table 5 shows that in the former model students achieved 4,4 EC. In the new model the level of achievement significantly increases with more than 40% to 6,2 EC.

Table 5 Number of EC aimed and achieved in the first year, for students in the New Educational Model and the reference group.

	Reference group	New Educational Model		
		Total	Degree students	Non-degree students
	N=3387	N=12192	N=6381	N=5811
Number of EC aimed	11,4	15,8*	21,6**	9,6
Number of EC achieved	4,4	6,2*	9,0**	3,2

*) The difference between the reference-group and the NOM-group is significant.

**) The difference between degree- and non-degree students is significant.

We thereby observe a difference in both registration and achievement between students that have the ambition to follow a complete degree program and students that register for a course and do not have this 'degree ambition'. We did the same analysis, but now for the first two study years of OUNL-students. Results are presented in table 6.

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Table 6 Number of EC aimed and achieved in the first two years, for students in the New Educational Model and the reference group.

	Reference group	New Educational Model		
		Total	Degree students	Non-degree students
	N=940	N=2542	N=1931	N=582
Number of EC aimed	29,5	42,5*	46,4**	30,0
Number of EC achieved	18,2	27,4*	30,0**	17,6

*) The difference between the reference-group and the NOM-group is significant.

**) The difference between degree- and non-degree students is significant.

Again, we see the effect of the new educational model on study pace. In the reference group of students, the mean amount of achieved credits after two years is 18 EC. This amount increases with 50% to 27 EC for students following courses in the new model. The amount of achieved EC in the new model is more than 40 EC after three years, where it was less than 30 in the former model, a remarkable positive difference. This can be seen in figure 4 in which also the proportion after one respectively two year study are presented.
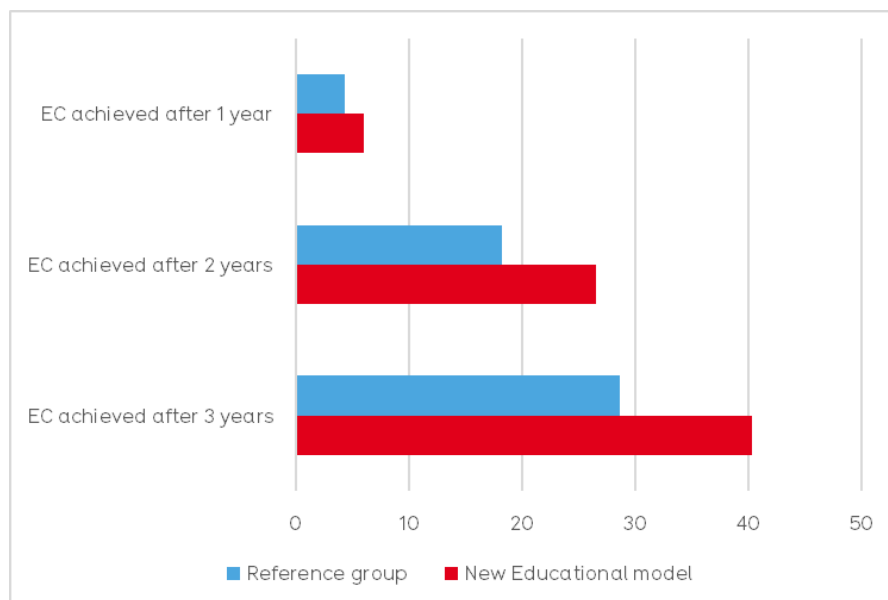
Figure 4 Number of EC achieved within 1, 2 and 3 years in the old and new model

Study pace is influenced by the format of the courses. OUNL uses a combination of so-called fixed and variable course formats within each degree program, but especially in the bachelor's programs. Courses with variable start dates are crucial to guarantee an important principle behind the educational model of OUNL, both the former and the new one: each new student should be offered the possibility to start studying as soon as possible (Open Universiteit, 2022a). However, if courses are fixed (with respect to start dates, dates of virtual meetings between students and lecturers, examination dates, etcetera) the proportion of students that pass their exam is higher than if courses are scheduled in a variable format. The only exception within OUNL are the courses by the Faculty of Law. This can be seen in table 7.

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Table 7 Proportion of students that pass their exam for first and follow up achievements, broken down by course type.

	First achievement		Follow up achievement	
	Fixed course	Flexible course	Fixed course	Flexible course
Culture	49,3%	27,5%	72,5%	73,2%
Computer Science	41,6%	34,5%	55,5%	48,6%
Management	33,2%	27,0%	47,4%	40,4%
Sustainability and envrionment	46,4%	28,7%	64,9%	50,9%
Psychology	48,1%	35,3%	73,5%	66,8%
Law	34,1%	34,0%	58,3%	64,3%
Total	42,7%	32,5%	65,5%	62,9%

Figure 5 shows the 'overall' passing-grades of the first course separately for degree students and non-degree students, with a fixed and a variable format. The proportion of students who pass their first course exam is larger in case of a fixed course, for both degree and non-degree students. It is obvious that the effect size is bigger in case of degree students.
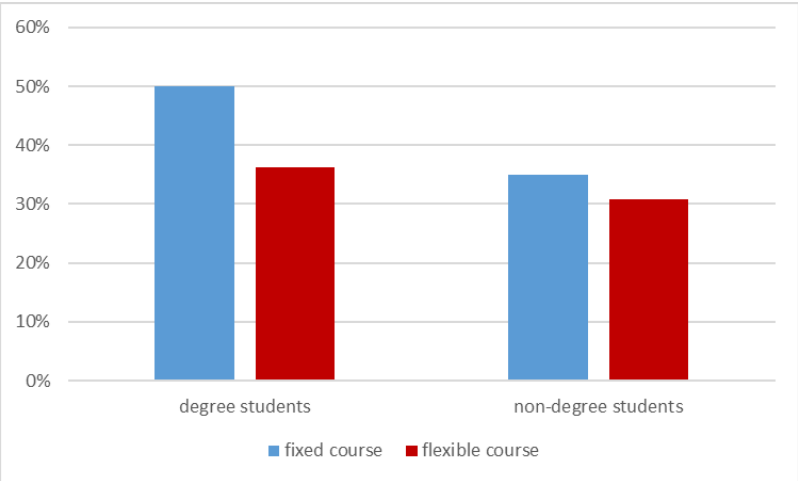
Figure 5 Proportion of students that pass the first course, broken down by fixed and flexible courses and by degree and non-degree students.
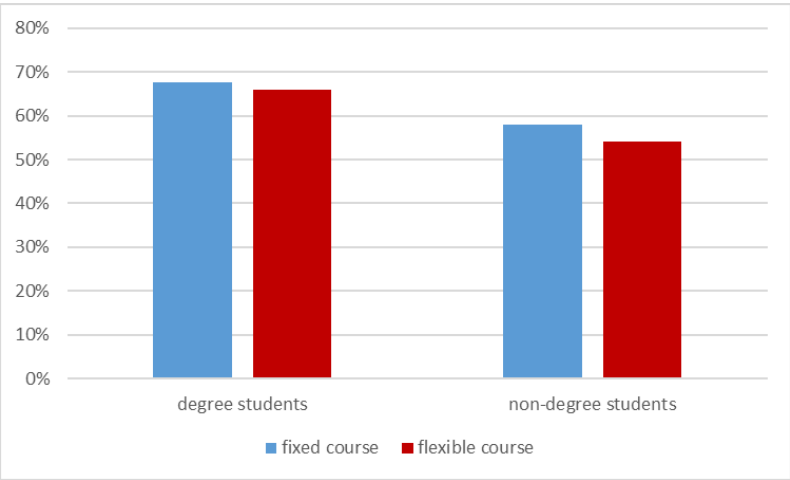
Figure 6 Proportion of students that pass a follow up course, broken down by course type and by degree and non-degree students.

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From figure 6 it becomes clear that the effect of course type on passing grades is much smaller and almost disappears in case of follow up courses. This is both the case for degree and non-degree students.

4.2 Satisfaction stays high

4.2.1 Master's students

OUNL regularly asks her students to give an overall score for the program they are following. In our surveys, the same question was asked for the old and the new programs. Programs with less than seven respondents in the survey again are not included in table 8 that shows results of this analysis.

Table 8 Overall satisfaction scores for the new and old programs 2015 - 2021

	Old model	New Model		
Master	2015	2016	2019	2021
Management and IT	7,6	7,6	7,2	7,8
Computer Science	8,0	8,3	7,0	7,3
Environmental Sciences	7,6	8,0	8,5	8,3
Humanities	7,4	8,0	8,0	8,4
Management	7,5	7,7	7,6	7,9
Educational Sciences	7,6	7,7	7,7	7,9
Psychology	7,7	8,1	7,6	7,7
Law	7,5	7,8	7,5	8,2
Software Engineering	8,3	8,0	7,8	8,3
Total	7,6	7,8	7,6	7,9

The average grade for the new programs is as high as those for the old ones. There are some minor changes between the overall scores but they are not significant. In general, students are still very positive about the programs. Nevertheless, we have observed the existence of a substantial group of students (approx. 15% of the student population) who are unhappy with the new model. When asked (with open questions in surveys and in focus groups), 11% of master's students makes a comment about flexibility. This comment is often negative in tone: students indicate that they did not come to OUNL for this (Schlusmans et al., 2018). This mainly concerns students who started in the former model that was characterized with a lot of freedom. They had to switch to the new one. We also encounter these objections amongst bachelor's degree students and they persist for a little longer, because of the larger number of study years in the bachelor.

Students were also asked whether they would recommend the program to others. A large majority of students would do this. Trend scores vary from 87% in 2015 to 85% in 2021 with the lowest score

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in 2017: 78%. However, satisfaction of master's students varies if we look in more detail: we also asked master's students to rate various aspects of the program on a five-point scale. These figures are shown in table 9.

Table 9 Satisfaction with different aspects of the master's programs 2015 and 2018
(in brackets the results for the old programs, scores based on sample sizes less than 10 in italics)

Aspect: (on a 1-5 scale)	Content	Coherence	Up to date	Guidance and support	Combination work/study	Sample (N)
Management and IT	4,0 (*4,2*)	4,0 (*4,0*)	3,9 (*4,0*)	3,5 (*3,8*)	3,6 (*3,0*)	57 (5)
Humanities	4,4 (*4,2*)	4,0 (*3,8*)	3,9 (*3,4*)	3,8 (*3,0*)	4,1 (*3,6*)	9 (5)
Management	4,1 (4,1)	4,1 (4,0)	3,9 (3,8)	3,5 (3,4)	3,4 (3,3)	114 (40)
Educational Sciences	4,2 (4,2)	3,9 (3,9)	4,1 (4,0)	3,7 (3,6)	3,5 (3,6)	75 (48)
Psychology	4,2 (4,1)	4,1 (3,9)	4,2 (3,2)	3,7 (3,6)	4,1 (3,9)	17 (18)
Law	4,0 (4,1)	3,8 (3,6)	3,8 (3,5)	3,2 (2,9)	3,4 (3,9)	23 (17)
Software Engineering	4,2 (*4,3*)	4,1 (*4,0*)	3,7 (*3,7*)	4,2 (*4,3*)	3,7 (*4,0*)	11 (3)
OUNL total	4,1 (4,1)	4,0 (3,9)	3,9 (3,7)	3,6 (3,5)	3,5 (3,6)	312 (141)

In general, students are very satisfied with the content, coherence and actuality of their programs. OUNL uses a score of 3,5 as a lower limit and nearly all scores are above this score. The students are least satisfied with the extent in which the study can be combined with other activities and with the guidance and support they get. With regard to the supervision in the new model, we see that students in 2018 are satisfied with the more intensive contact with lecturers. The (now sometimes mandatory) virtual meetings are received with mixed feelings. Students want to see benefit, and this is only the case when there is interaction, when it is substantive and when the meeting is well organized. The latter is not always the case, mainly due to technical problems with the virtual classroom. In activating education, students regularly make assignments and papers. They like this, but then they expect meaningful feedback from the lecturer.

Schlusmans et al. (2018a, 2018b) and Van den Munckhof et al. (2017) reported about the effects of the new model with its emphasis on tutoring and support, visibility of the lecturers, and increase of meetings on the satisfaction of students with the support they receive from lecturers and study counselors. In the former model, there existed a large group of students that did not use tutoring and/or student support at all. Thirty percent of the very experienced students in 2014 had never contacted a lecturer to ask a question and almost half of the students had ever participated in a meeting. In general, the students who did use the tutoring and support on offer were quite satisfied. The majority of students however reported that they prefer studying on their own.

In the new model, more students use the tutoring and support on offer. More sessions are in fact semi compulsory and there is more contact with the lecturers. The appreciation of the quality of the lecturers is much higher in the new model, but the meetings score lower. An analysis of the open answers showed that students are quite critical of the benefit of meetings, both face-to-face and virtual (Van den Munckhof et al., 2017). Students want quick replies to their questions and good

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personal feedback and they really appreciate it when a lecturer knows them and knows about their progress.

The same varied picture emerged from the field tests of the new courses in 2016. Students are generally satisfied in 2016 with the courses in the new master's programs; in particular, the content, the lecturer support, the testing and the materials score high. Although 60% of the students at that time appears to appreciate the new structure with the tight schedule and say that, they need deadlines and a tight schedule to get ahead, 15% of the students regret the introduction of deadlines and the reduction of freedom. For them it is more difficult to combine the study with other activities and a week's holiday or peak periods at work lead to delays. Those students also indicate that the new system is too rigid for adult education.

Another issue that was mentioned very often are meetings. Students expect benefit from face-to-face and virtual meetings and that is not always the case. In quite a lot of the course evaluations more than 20% of students indicate that they are dissatisfied with the quality of the face-to-face-meetings. We have also seen course evaluations where a quarter of the students say that they are (also) dissatisfied with the quality and the added value of the virtual meetings. The open questions in our surveys also show that there regularly were technical problems with the virtual meetings.

In the survey and in the interviews in 2016 the following positive and negative points of the new programs came up. Positive points were ability to study independently, still enough flexibility, quality of the content, structure of the program with deadlines, quality of the courses, quality of the contact with lecturers, opportunity to study online. Quite a lot of students were still very positive about the fact that is possible to combine study and work. They felt that the new programs had enough flexibility and that the structure with deadlines was helpful to them. They were also very positive about the content of the program and the quality of the courses. They especially liked the fact that they had more contact with the staff. As negative points of the new model students mentioned in 2016: organization, too many online materials, loss of flexibility, quality and added value of meetings, and quality of the feedback.

Especially students who previously had a bachelor's degree in the old model did regret the organization with much more restrictions and a reduction of freedom. Although they admitted that deadlines helped them to progress, they found it is more difficult to cope with unexpected events such as deadlines at work or family matters. They also did regret that there were no activities in the summer holiday as for some students this is their preferred period for study. Students in general did not like parallel courses as often deadlines and peak periods coming together. Quite a lot of students complained about the fact that materials are only delivered online. They preferred to have printed copies of readers and longer reading texts. Negative comments about the virtual classroom in 2016 were mainly about technical problems. In general, students liked the fact that they did not have to travel for a virtual classroom. They liked face-to-face-meetings if they have added value. As students have to travel, they really want to get something out of these meetings. Some students also complained that the feedback they got on the assignments was sometimes very limited.

Now, a couple of years later, we can look at the changes in satisfaction for master's students. Results are presented in table 10. We conclude from the comparison between table 9 and 10 that the high satisfaction scores in earlier years remain at a high level in 2021. If there is already a trend (sample

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sizes per discipline are sometimes too small for firm conclusions), it is an upward one. We don't observe scores below the 'OUNL lower limit' of 3,5 anymore.

Table 10 Satisfaction with different aspects of the master's programs 2022

Aspect: (on a 1-5 scale)	Content	Coherence	Up to date	Guidance and support	Combination work/study	Sample (N)
Management and IT	3,9	3,8	4,1	3,7	4,0	140
Computer Science	4,5	3,6	4,0	4,0	4,2	11
Environmental Sciences	4,0	3,5	3,7	4,1	3,8	24
Humanities	4,3	3,5	4,0	4,1	3,8	46
Management	4,1	3,9	3,8	3,7	3,8	289
Educational Sciences	4,1	3,7	4,0	3,7	3,9	92
Psychology	4,1	3,7	3,9	3,7	4,0	122
Law	4,3	3,8	4,2	3,8	3,9	72
Software Engineering	4,2	4,0	4,0	4,2	3,9	41
OUNL total	**4,2**	**3,8**	**3,8**	**3,8**	**3,9**	**847**

4.2.2 Bachelor's students

We also looked in more detail to satisfaction with the various aspects of the bachelor's programs. In general, we observe (see table 11) the same positive effects as among master's programs (see table 10). This time with the exception of the aspect 'coherence' of the program. Scores on this aspect are somewhat lower, although still high among students in the new programs compared to the students in the reference group 2013-2014.

Table 11 Satisfaction with different aspects of the bachelor's programs 2022
(in brackets the results for the old programs 2016)

Aspect: (on a 1-5 scale)	Content	Coherence	Up to date	Guidance and support	Combination work/study	Sample size N
Management	4,0 (4,2)	3,8 (4,1)	3,8 (3,7)	3,5 (3,7)	4,1 (3,9)	155 (63)
Informatics	4,2 (4,2)	3,9 (4,0)	3,7 (3,3)	3,9 (3,8)	4,1 (3,7)	195 (89)
Information science	4,3 (4,0)	4,0 (3,8)	3,9 (3,6)	4,0 (3,6)	4,0 (3,2)	41 (16)
Humanities	4,3 (4,4)	3,9 (4,0)	3,7 (3,6)	3,8 (3,5)	3,9 (3,8)	636 (333)
Environmental Science	4,3 (4,1)	4,0 (3,9)	4,1 (3,6)	4,0 (3,7)	4,0 (3,7)	118 (53)
Psychology	4,2 (4,2)	3,8 (4,0)	3,8 (3,7)	3,3 (3,4)	3,7 (3,8)	900 (358)
Law	4,1 (4,1)	3,7 (3,8)	4,0 (3,6)	3,7 (3,2)	3,8 (3,6)	500 (263)
OUNL total	**4,2 (4,2)**	**3,8 (4,0)**	**3,8 (3,6)**	**3,6 (3,4)**	**3,9 (3,7)**	**1370 (1175)**

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With regard to student satisfaction, we observe that students are reasonably satisfied at course level. Only 10 percent of the students are dissatisfied with the timetable at course level. With regard to supervision, we see that students are slightly less satisfied with the quality of the meetings than with the quality of the course material and the learning management system (LMS). A frequently heard comment from students is that in a number of cases they do not understand why a course is fixed, if there are no supervision meetings.

We also see a clear decline in student satisfaction with the combination of learning with other activities. In particular, the number of students who would unreservedly recommend an OUNL course to others has fallen in recent years. Analysis of the open answers shows that this is mainly due to the loss of flexibility. A dilemma thus emerges here. Students want more flexibility and that is why they are generally less satisfied. We also see that more OUNL alumni choose to follow a master's degree program elsewhere after they have achieved their bachelor's degree at OUNL. Although some may say that this is a pity, we interpret this phenomenon as positive: more than before a bachelor's degree from OUNL seems to function as a preparation for a master's degree program elsewhere.

The overall satisfaction of bachelor's students remains at a high level, as can be seen in table 12. The scores are more or less the same as those of the master's students (see table 8).

Table 12 Overall satisfaction scores for the new and old bachelor's programs 2015 - 2021

	Former educational model		New educational model	
Bachelor's programme	**2015**	**2016**	**2019**	**2022**
Management	7,7	7,9	7,8	7,9
Informatics	8	7,7	7,8	8
Information science	8,1	7,6	8,2	8,6
Humanities	7,9	7,9	8	8
Environmental Science	8	7,7	8,2	8,2
Psychology	7,8	7,7	7,8	7,7
Law	7,7	7,5	7,5	7,8
OUNL total	**7,8**	**7,7**	**7,8**	**7,9**

The blended model of the bachelor's degree programs was designed with the idea of providing this flexibility through variable courses. However, many students do not see this. In terms of numbers of students that pass their exam the variable courses in the new model, perform worse than these

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courses in the former model. A reason for this could be that in the case of parallel programming, students give priority to the fixed courses that are organized at the same time.

4.2.3 Lecturers and student counselors

After initial skepticism, in 2018 the lecturers and student counselors are positive about the new model. For the majority of lecturers, the new teaching model is an improvement over the former one. Master's lecturers are more positive than their bachelor's colleagues are. In the bachelor's degree programs, the number of convinced positive lecturers is somewhat lower: more than 15 percent consider the new model a clear improvement, almost 40 percent reports slight improvement. Nearly a quarter of the bachelor's lecturers believes that the new model is a deterioration. For the master's degree, this share is somewhat lower and amounts to 17 percent. Lecturers seem to be particularly satisfied with the higher proportion of students that pass their exams. In addition, an important role is also attributed to the well-functioning LMS at that time.
An urgent need for student counselors in 2018 is the availability of a student tracking system to follow the progress of their students. Lecturers, like students, are most concerned about the reduced flexibility of education and the associated problems for students. The high work pressure among lecturers is also mentioned as often in 2018 as in 2013. According to them, the introduction of the new model did not bring them more time for research or for more student support.

In 2021, based on similar surveys among lecturers and a meeting with student counselors, we see partly the same and partly different results. An efficient/effective system to monitor study progress is still an important wish for both student counselors and lecturers. The student counselors in particular need such a student tracking system in which all facets of contact with the student can be properly recorded, in which insight could be obtained quickly based on certain criteria, and in which students can be proactively offered study advice at any time. A rough estimate by the student counselors indicates that in 2022 approximately one fifth of master's students makes use of the option (offered by personal email) to conduct an individual study advice interview. This share is probably slightly higher for bachelor's students. In addition, online and face-to-face group discussions are organized in which student counselors answer questions from students.

Again, work pressure among lecturers did not change substantially. It remained at a rather high level between 2018 and 2021. Especially the dissatisfaction with the amount of time available for supervising students is mentioned. Little seems to have changed here with the introduction of the new model. Other factors seem to be more relevant and maybe the following one plays a role: lack of staff. Between 2018 and 2021 both, the number of OUNL students and the number of EC obtained by them showed an increase of 20%, while the number of staff members increased by 13% (Open Universiteit, 2022b). Both the lack of enough time among lecturers to give feedback on student work and work pressure can be influenced by this discrepancy.
The disadvantages of less freedom of choice for students are mentioned much less (both by lecturers and students) in 2021 than in the years immediately after the introduction of the new educational model, indicating that a crucial element of the new model, more steering by introducing more structure within both the courses and the bachelor's and master's curricula, is appreciated by most students now.

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4.3 Dropout stays more or less the same

4.3.1 Master's students
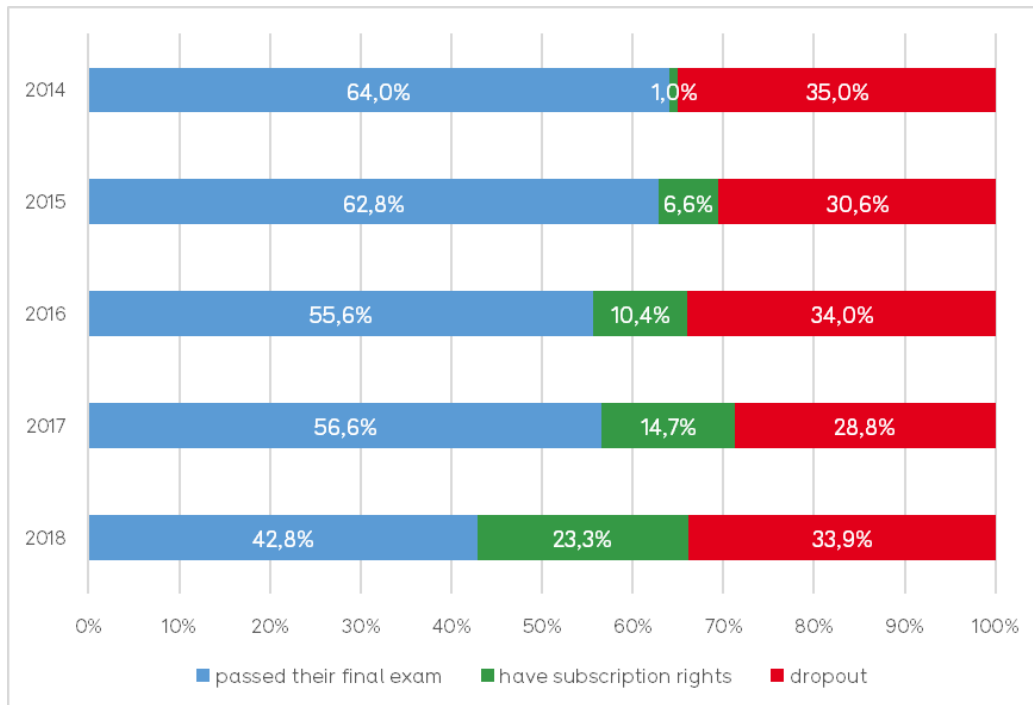
Figure 7 Proportion of students that passed their final degree exam, still have subscription or dropped out.

Figure 7 illustrates (in blue) the proportion of students that pass their final degree exam. In red, the dropout rate is given and in green, the percentage of students is shown which still have subscription rights and may pass their degree exam in the near future. We can observe that (more or less one third) of each cohort of new students stop without a Diploma.

For the reference group, we analyzed how many students have dropped out, how many still have registration rights and how many have already obtained a bachelor's or master's degree. We did the same with the students who have studied or are studying in the new model. For the reference group, the proportion of students who obtained a diploma is 56%. Among the students in the new model who started in 2014 or 2015 the proportion is somewhat higher: 62% and 61% respectively. In later years, we see of course many students with registration rights, of which we will have to wait and see whether they will still receive their diploma.

Somewhat more detail about master degree students is given in figure 9. We conclude that dropout already takes place in the first 12 months (8%) and increases to 18% after 24 months, being the 'normal' period to pass a master's exam with a study pace of 30EC per year.

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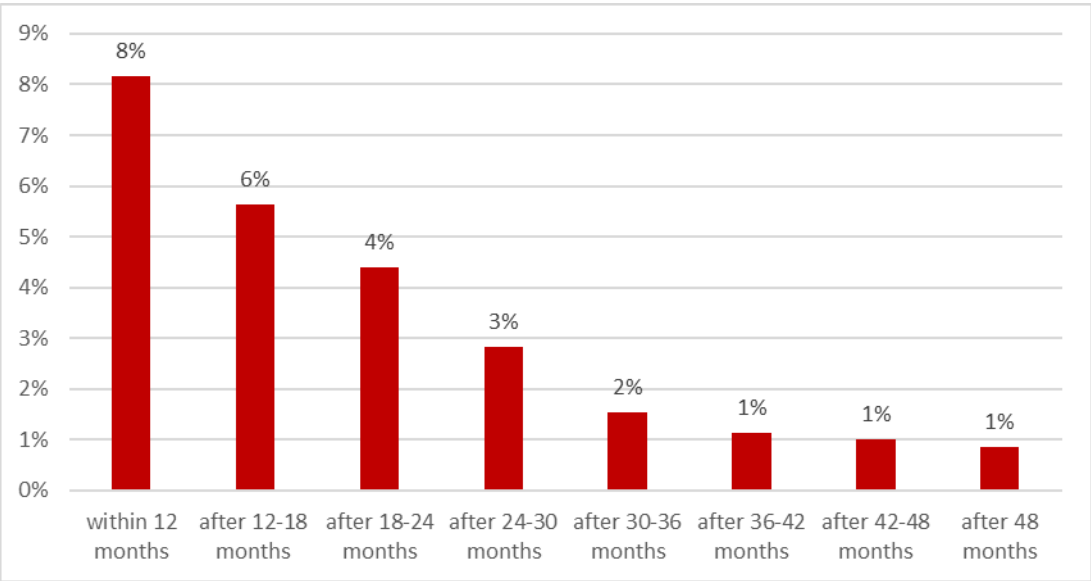
Figure 8 Proportion of dropouts of master degree students

From more detailed analyses (not reported in this paper), we conclude that a considerable proportion of those who dropout are already well advanced in their study. In some master's programs (Management Sciences, Business Process Management and IT, Psychology) about 40% of these dropouts are in the thesis phase. These students have registered for the preparation course of the thesis or for the thesis course itself, and still fail with the finish line in sight (Van den Munckhof et al., 2021). This phenomenon can also be seen in figure 9.
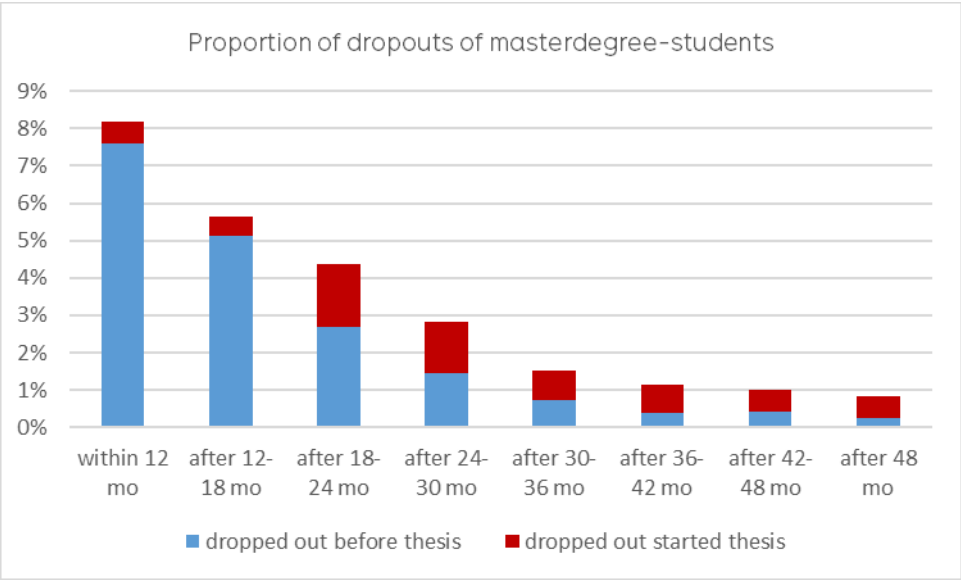
Figure 9 Dropout of students who started their master's program at least 3 years ago, having no subscription rights anymore

Figure 9 shows in red the proportion of students without subscription rights although these students have already started with their master's thesis. Some of them may come back, we know from

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experience, but a lot of them will not pass their degree exam. In blue the proportion of students that have stopped without starting their thesis course is given. The red part of figure 9 was the main argument for OUNL to look in more detail to the thesis courses. When students have already invested such a lot (both time and budget), OUNL sees it as an obligation to see how she can prevent those who have the 'finish line' in plain sight from dropping out.

4.3.2 Bachelor's students

For the bachelor's programs, we cannot present the dropout on program-level yet. The time since the introduction of the new model in the bachelor's programs is still too short. Therefore, for the bachelor's students we have analyzed how many students register again for a course in the second and in the third year of their study (figure 10). Students who do not register again after two years can, according to this indicator be seen as dropouts, at least for a long period of 24 months.
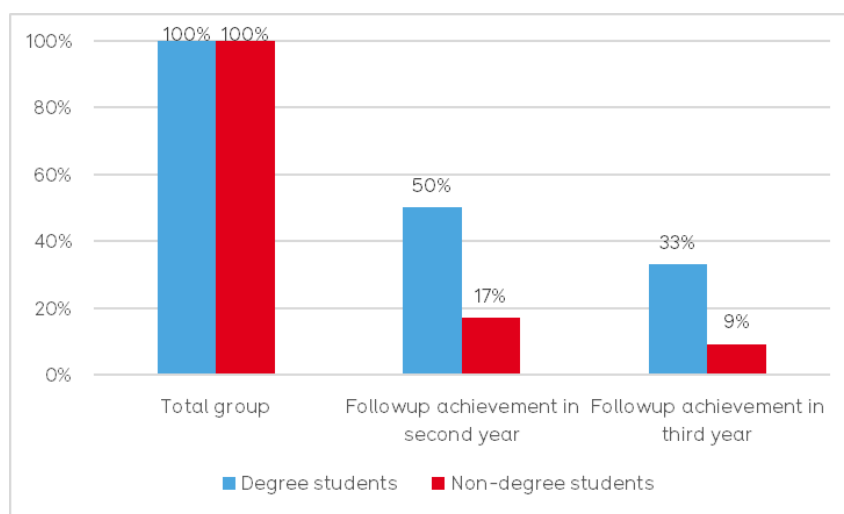
Figure 10 Proportion of students that registers for a follow up course in the second and third year

We again observe a difference between degree and non-degree students. Two thirds of the degree students and nine out of ten non-degree students do not show a follow up achievement in the third year. Although degree students of course can 'restart' in the fourth year and many non-degree students maybe had the intention to follow only one course, these dropout rates are high. It is obvious that, compared to the master programs, these dropout rates are much higher in the bachelor's programs.

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In figure 11 we present these data from another point of view to answer the question 'Did dropout rate change after the introduction of the new model?'
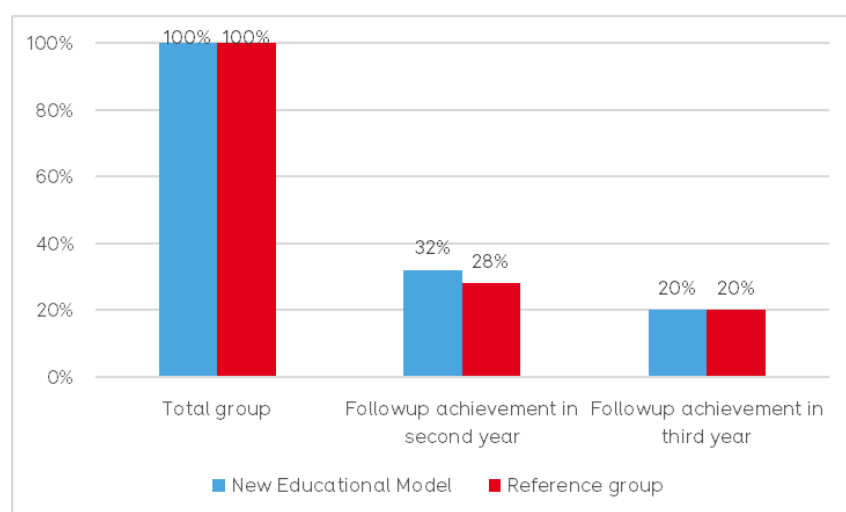
Figure 11 Proportion of students that registers again for a course in the second and third year

Only 20% of the cohort of new students register after three years for another course and we do not see an effect of the new educational model with respect to this indicator of drop out, at least not in the third year after the start to study.

5. Conclusion

OUNL changed her educational model in 2013 and implemented it into her bachelor's and master's degree programs between 2014 and 2018. OUNL-wide programs were formulated to implement these changes and to look for further refinements. Several evaluation studies were set up to see what worked well and what did not. Our findings suggest that dropout rates are more or less the same as before, but students study faster, especially master's students. They achieve more EC per year than in the former educational model. Student satisfaction was already high at OUNL before 2015 (amongst the highest compared to the other Dutch universities) and remained high since. We conclude that more emphasis on degree programs and the introduction of more structure and social integration helped to improve study pace. The introduction of more activating elements in courses also led to more satisfaction amongst students. The students (especially those who already passed more than 10 EC) like the content of the programs and favor the possibilities to have more contact with their lecturers.

There is still room for improvement, especially with respect to the quality of the feedback from lecturers to students and the level of engagement of students with lecturers and other students. Writing a thesis, for most students the last step before they pass their bachelor's or master's exam, also needs more attention within several study programs. In 2021, based on several evaluations, it

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was decided by the board of OUNL to implement the following refinements (Open Universiteit, 2022a):

- more contact with students in many courses
- more time for lecturers to adapt curricula (including the revision of exam schedules) to allow studying at tempos higher than 30 EC
- more guidance in courses with a variable start date
- more activities for the alumni of the various study programs
- more stimulation of mutual student meetings, for example in the form of testing grounds to see what works well
- More attention for short learning programs (15 EC-programs).

The last refinement has not much to do with the educational model as such, but follows from OUNL research on target groups and their demands with respect to continuous education (Melai et al., 2020; Open Universiteit, 2022b). For an increasing number of working professionals a complete academic program takes too much time, but individual courses do not satisfy. Therefore each of the faculties of OUNL has started (from academic year 2021-2022 onwards) with short learning programs (SLP's). These SLP's are linked by a common thread, preferably with focus on a societal issue, and feature a separate assessment.

Two important conditions for the other refinements to bring students more success in terms of higher study pace, more satisfaction and reduction of dropout, will be the decrease of work pressure of lecturers respectively the availability of a modern student tracking system. These two factors did not change between 2014 and 2021. In 2022, however OUNL showed progress with respect to the acquisition and implementation of a new student tracking system, a new LMS and a new system for online examination. It is expected that these technological developments will support finding a good balance between the amount of flexibility from the perspective of OUNL students (freedom of time, pace and space to study) and the amount of student support that can be given by both lecturers and student counselors.

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Building Learning Analytics Dashboards for Distance Learning through Data Pipelines

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Abstract

Distance Learning (DL) that Covid19 pandemic brought into the spotlight, is a flexible methodological approach that made its appearance in the educational landscape more than one hundred years ago. Thus, well-grounded learning theories have already provided guidelines for serving DL values and learning goals. According to M. G. Moore's statement on Transactional Learning Theory in 1972, there is a close relationship between DL and the media affordances that are required to support it.

Furthermore, the new needs of academia that call for assessment, performance, accountability and decision-making at an institutional level, heavily rely on insightful knowledge. Data Science contributes to this setting by introducing a new way of solving problems by backing up decision-making through Educational Data Mining and LA, filling in this way the gap of proximity that physical and temporal distance poses. One of the available back-end solutions for DL courses that relieve the consequences of missing face-to-face communication is the creation and usage of Learning Analytics Dashboards (LADs). The LADs provide fine-grained data, distilled information and specialized summarized knowledge on the learning procedure, the students' progress and the courses' completion status, in a way that even non-expert users can benefit from them. Focusing on the social aspects of learning in particular, Social Network Analysis (SNA) is used more and more lately to explain, in a simple way, complex interactions by measuring and visualizing students' behavior within online learning environments.

In this work, we augment the information provided through LADs with visualizations from SNA graphs that indicate how well students or instructors interact with each other. For creating theory-inspired, information-rich, adjustable to the educational needs and easily interpretable LADs, up-to-date technological tools are required. Data Pipelines can support this operation to its full extent, by supporting the creation of interactive LADs on the fly, that enable a formative assessment that is necessary for a continuous evaluation and assessment in the learning process. This chapter presents the final step of an analytical methodology of an educational data mining process, by demonstrating the results that are generated and presented to the stakeholders. In addition, the implementation and the experimental testing are presented. Students of different learning and interacting profile are also identified. Some typical students' attitudes (i.e., "lonely

wolfs" and "super posters") are also revealed as according to tutors, network metrics indicate the differences between the leadership style that each student adopts. Moreover, the DL community is evaluated as a whole, and critical conclusions about its functionality and efficiency are drawn.

Keywords: distance learning, data pipelines, learning analytics dashboards

1. Introduction

Distance Learning (DL) that Covid19 pandemic brought into the spotlight, is a flexible methodological approach that made its appearance in the educational landscape more than one hundred years ago. Thus, well-grounded learning theories have already provided guidelines for serving DL values and learning goals. According to M. G. Moore's statement on Transactional Learning Theory in 1972, there is a close relationship between DL and the media affordances that are required to support it (Moore, 2013).

Furthermore, the new needs of academia that call for assessment, performance, accountability and decision-making at an institutional level, heavily rely on insightful knowledge. Data Science contributes to this setting by introducing a new way of solving problems by backing up decision-making through Educational Data Mining and Learning Analytics, filling in this way the gap of proximity that physical and temporal distance poses. One of the available back-end solutions for DL courses that relieves the consequences of missing face-to-face communication, is the creation and usage of Learning Analytics Dashboards (LADs). The LADs provide fine-grained data, distilled information and specialized summarized knowledge on the learning procedure, the students' progress and the completion status of the courses, in a way that even non-expert users can benefit from them. Focusing on the social aspects of learning in particular, Social Network Analysis (SNA) is used more and more lately to explain, in a simple way, complex interactions by measuring and visualizing students' behavior within online learning environments.

2. Theoretical background and related work

2.1 Learning Analytics for improving Distance Learning

Education, as a living and rapidly transforming organism, needs sophisticated methods to collect, analyze and act upon data. Actually, higher levels of complexity demand more sophisticated ways of information processing. The business sector has benefited and reaped rewards for the insights provided by data analytics and it would not be an exaggeration to say that it has revolutionized the way commerce works today. It would be really useful if education stakeholders could find ways, consistent with pedagogical values and related to the educational demands, to apply these successful models with the same extraordinary results.

Learning Analytics (LA)involves analyzing data that has been collected from different educational contexts and environments, and from various levels with the view of discovering patterns. By gaining this knowledge, decisions can be made and changes can be implemented which will bring about favorable outcomes for the students and the institutions. In other words, LA should be the "brain" that coordinates evidence-based improvements to the educational ecosystem.

A widely accepted definition of LA was proposed by Long & Siemens (2011) who mentions that *"Learning analytics is the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs"*. The high expectations of this relatively new field of research is expressed by Siemens (2012) who stated that *"LA has the potential to dramatically impact the existing models of education and to generate new insights into what works and what does not work in teaching and learning".* Moreover, recently, the analysis of the existing evidence for LA indicates that there is a shift towards a deeper understanding of students' learning experiences

(Viberg, Hatakka, Bälter & Mavroudi, 2018). LA focuses on the specific problem of understanding and optimizing factors that lead to a successful educational experience for all learners (Mangaroska & Giannakos, 2018). The implication of LA and the evaluation of its impact on learning is one of the key challenges in the educational field (Tan & Koh, 2017). Also, one key principle in the "Global guidelines for ethics in LA" is to consider whether access to knowing and understanding more about how students learn brings with it a moral obligation to act (Slade & Tait, 2019).

There are many ways in which LA can impact education. A taxonomy of the LA types depending on their result is described by Downes (2019) and contains descriptive analytics, diagnostic analytics, predictive analytics, prescriptive analytics, generative analytics and deontic analytics. Additionally, a research article concerning the implementation of LA in countries identified seven major factors that should be taken into account: power, pedagogy, validity, regulation, complexity, ethics, and affect (Ferguson, Clow, Griffiths & Brasher, 2019).

2.2 The use of Social Network Analysis

The social behavior of the students is mainly expressed in the discussion forum within the context of online learning. There are multiple ways that students use the discussion forum: they can interact with peers and their tutors, ask questions about their courses, or simply socialize and talking about general subjects. Regardless of the specific purpose of the posts, a discussion forum can provide information about students' behavior, tendencies, emotions or even learning styles that can help education stakeholders to design, prepare and adjust the course to learners' needs. These benefits are highly recognized in the educational field (Downes, 2020).

In order to gain insight into the educational needs of distance learning students, different point of view needs to be adapted besides from logs count. For example, engagement can be measured by merely counting the number of students' logins. Therefore, educational institutions need to focus on adopting more holistic approaches (Ferguson et al., 2019). Social network analysis can provide measures, help in the visualization of the data and respond to complex research issues such as collaborative learning (Sergis & Sampson, 2017). There are available tools that permit an in-depth analysis of the data, providing measures that show how members of the community are placed in the network, as well as indications about their rapport or their influence. Analysis of influence and susceptibility together with network structure reveals that influential individuals are less susceptible to influence than noninfluential individuals (Aral & Walker, 2012). However, in education, things are more complex. Tutors with very high influence in the network may undermine students' autonomy (Anderson, 2013). At the same time, peer interaction is of great importance (Krouska et al., 2019; Tsoni et al., 2019). Thus, there should be a thin line between influential or leading network members and centrality distribution in order to have a functional collaboration community. Perhaps the biggest outcome of Social Network Analysis is the ability to draw conclusions in very complex problems based on nodes' characteristics (Krouska et al., 2029). This is justified by the argument of Borgatti & Halgin (2011): "Any theory of social networks must take into account actors' agency in creating those networks. The problem with this is that it is not the actors' intentions and actions leading to occupying a certain position that creates the outcome but the actual occupation of the position."

2.3 Data Pipelines to automize a Learning Analytics Cycle

In the last years, there is a rising trend in the use of data pipelines. Pipelines are collections of processes that can transfer and transform data from various sources aiming to create new knowledge. Sophisticated analyses and reports and Machine Learning often are based on data pipelines. A simple form of a data pipeline transfers data from a source and loads them to a destination. However, this process may consist of multiple steps

including data extraction, data preprocessing, data validation, and occasionally training or executing a machine learning algorithm before delivering the data to a final destination. These steps are defined by the magnitude and the structure of the data. Additionally, the focus of the research determines the type of modeling and visualization that would be incorporated.

There is a large amount of generated data behind online actions. In educational learning environments, multiple sources need to be combined in order to produce actionable and meaningful results. For effective implementation of an LA cycle, data pipelines can offer automation and repeatability of several different versions in order to satisfy the educational demands. Some of the main benefits of data pipelines include that they minimize human intervention and therefore there is a significant time and effort gain. The repeatability that they offer can ensure the validity of the results since the experiments can be repeated. Additionally, privacy protection techniques can be incorporated so that personal rights can be reserved. Due to the sensitive and ever-changing nature of educational research, often there is a need of changing parts of the LA process. Data pipelines allow the customization of any part of the process offering flexibility and adaptability. Furthermore, they provide extensibility and scalability in big data. Finally, the results can be reported in interactive dashboards.

3. Methodology

The description of the methodology that was applied is resented in this section. First, we describe the dataset that was used for the analysis and in the next sub-section we present the design and creation of the data pipeline that performs the tasks of the LA cycle.

3.1 Dataset

The implementation of the analysis was made in a selected educational dataset. Data were mined from the LMS that supports a two-year postgraduate program at the School of Science and Technology at the Hellenic Open University (HOU). A log file containing the online activity of 38 students and their tutors that participated actively in the discussion forum during the first and the second month of a module that lasts an academic year. The students of the module were divided into five classes each one of which had a different tutor to support them but the same curriculum, workload and deadlines concerning their assignments. There are two facts that have to be noted: firstly, that this period reflects the first experience of the students of the program and for a large number of them, their first experience in distance learning. The second fact concerns the number of participants which is significantly lower than the total number of students in the module (that is 84 in total). Participation in the forum is optional, and no external motivation was provided to the students in order to actively participate. Hence, students who did participate actively (i.e., students that posted at least once) did it from genuine interest to interact with their peers or their tutors in a formal communication environment. Additionally, since data are from the first period of the module, some students were probably hesitant to publicly pose their questions or express their opinions. The above reasons explain to a large extent the low participation rate of students in the forum community.

The log file that was loaded into the pipeline consisted of 55393 rows and 10 columns that include a detailed description of students' and tutors' logs. This information-rich column was used for extracting attributes concerning the detailed forum activity, i.e. who posted on which discussion, when, how many times etc.

3.2 Designing and creating the data pipeline

The KNIME (Konstanz Information Miner) platform was used to create a pipeline of three parts. Initially, the log data were imported through an excel file using the additional reader node. Two main parts of the pipeline, denoted with the red and the orange rectangles in Figure 1, are running in parallel and preparing the data for the final component that contains the visualization nodes and creates the final dashboard.
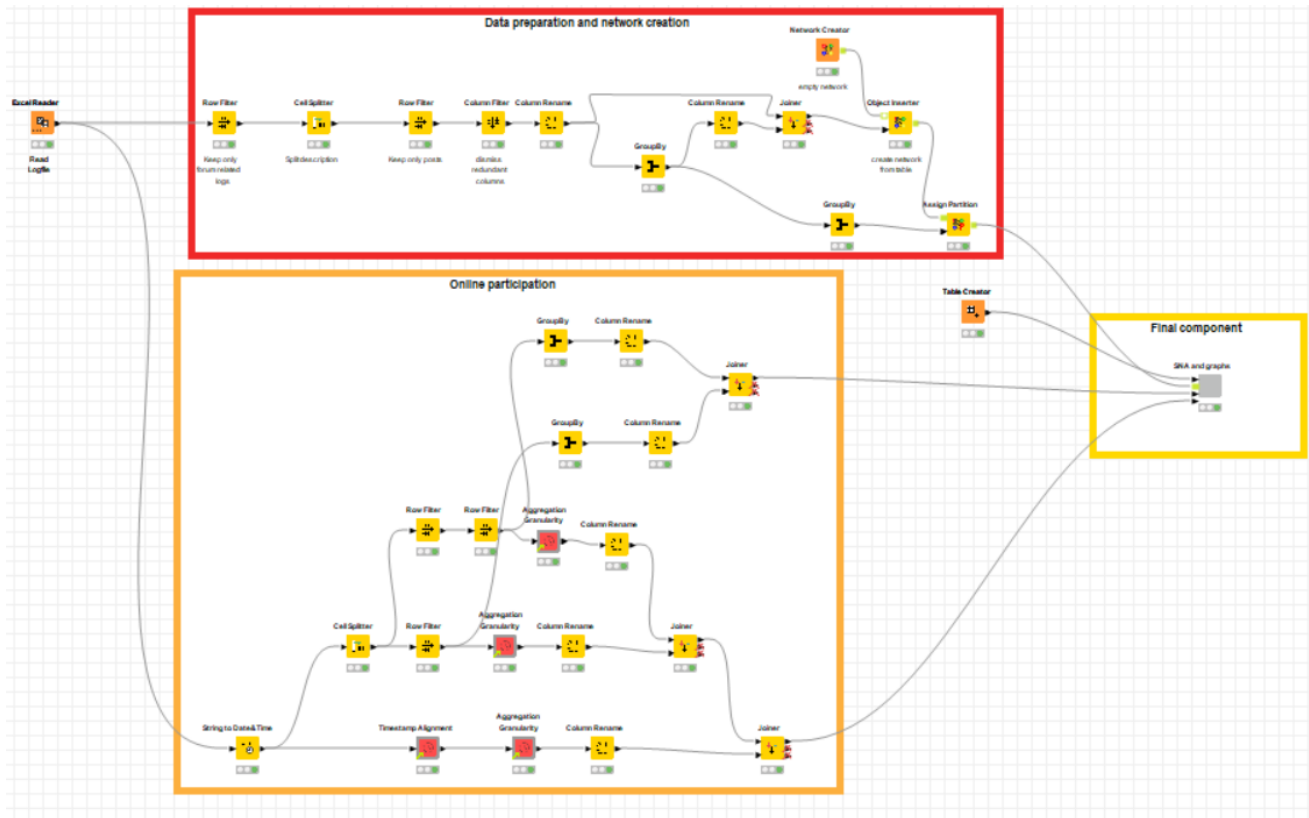
Figure 1: The outline of the pipeline.

The data preparation and network creation part of the pipeline (red rectangle in Figure 1) mainly contains data pre-processing nodes. There, data are filtered, cleaned, aggregated, labeled and then, imported into network-related nodes. The part of the pipeline in the orange rectangle is about the online participation of the students and tutors. It undertakes mostly computational tasks aiming to produce metrics about the number of logs, views, posts, etc of the module's participants individually. The final part of the pipeline is a component. Components in KNIME are wrapped-up functionalities that perform a set of processes. Their main advantage is that they can report the results of the visualization nodes that they contain in a dashboard of high interactivity. Several widgets can be added to further customize the presented result and provide the front-end users the opportunity to adjust the views to their interests. Figure 2 is a screenshot of the expansion of the final component.
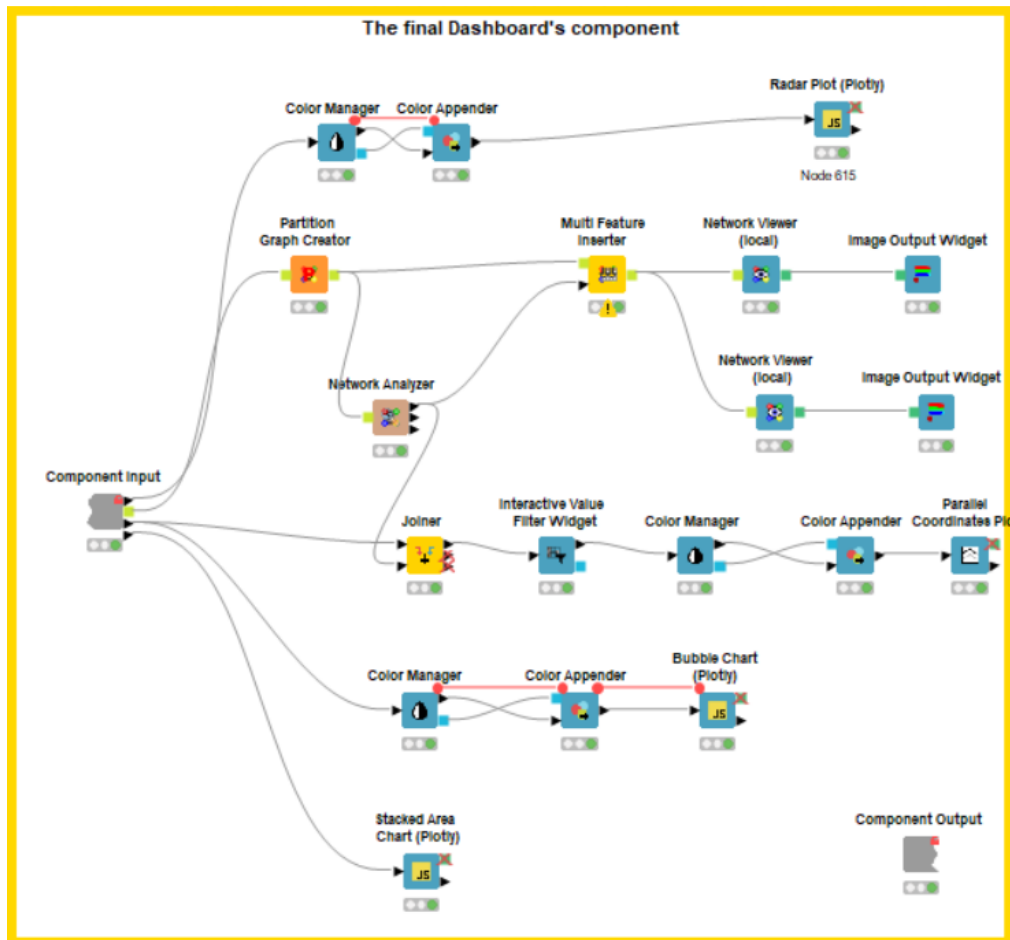
Figure 2: The expansion of the final component.

There are three types of nodes in this part of the pipeline:

1. computational nodes, mainly for producing Social Network Analisis metrics. There some of the most important metrics are computed such as weighted degree, closeness centrality, hub and authority score from HITs algorithm etc.,
2. widgets to extract non-supported visuals into the dashboard and to increase its interactivity,
3. visualization nodes to create the final graphs.

In total, the practical benefit of creating this pipeline is that its input is a log file extracted by the LMS of the module and the output is an interactive Dashboard that reports the results in an interpretable and pedagogically meaningful way.

4. Results and Discussion

In this section, some of the most indicative results that are included in the dashboard will be presented and discussed. The dashboard reports the following graphs in a quotation so that the front-end user can review them by scrolling down. The first graph (Figure 3) aims to provide information about the average grade of the students of each class in the assignments and the quizzes in the radar plot. The radar plot in general displays each row in a data set as a separate line on a circular plot. Each radii corresponds to a different feature of the row. Only numeric variables can be imprinted and there is a limit to the plot's readability (approximately 20 or fewer rows in order to be understandable). Therefore, this graph can be useful for visualizing relationships between the different classes of the module. The main benefit of incorporating this graph into the pipeline is

that when future assignments will be added to a dataset update, the graph will maintain its functionality (by simply rising the number of radii) allowing comparisons between classes. This particular graph shows that students in class E46 have the best performance on the quiz, however, the best performance in the first written assignment was achieved by the students of class E44.
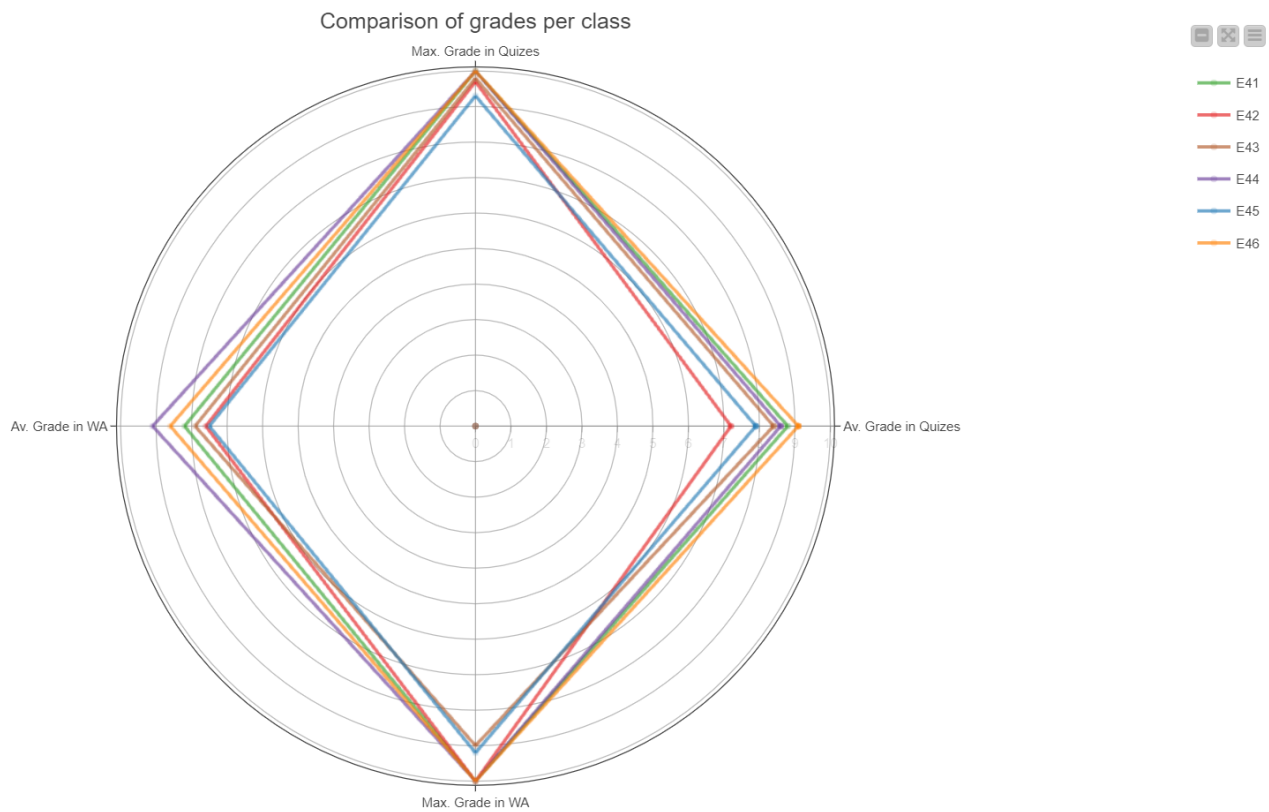
Figure 3: Radar plot of students' grades per class.

The next graph in the dashboard concerns students' and tutors' presence in the forum community. In general, bubble charts are used to display three dimensions or features two along the X and Y Axes, and a third displayed as the relative size of the 'bubbles' in the plot). Additional information can be presented by assigning a label or category to each bubble's color. Although it is similar to a scatter plot in use and functionality, it can illustrate more features. The overall picture of bubble charts can be used to indicate possible patterns or correlations. In this case, the bubble chart was used to visually investigate the participation in the forum either auditing (forum views), either active (forum posts). Every bubble denotes a participant colored by their type (student or tutor). Y-axis represents the number of forum posts and the size denotes the number of forum posts. It is shown that tutors are actively supporting the communication (high number of posts) and closely auditing the students' interaction (high number of views), while students have not yet been engaged in the discussion community.
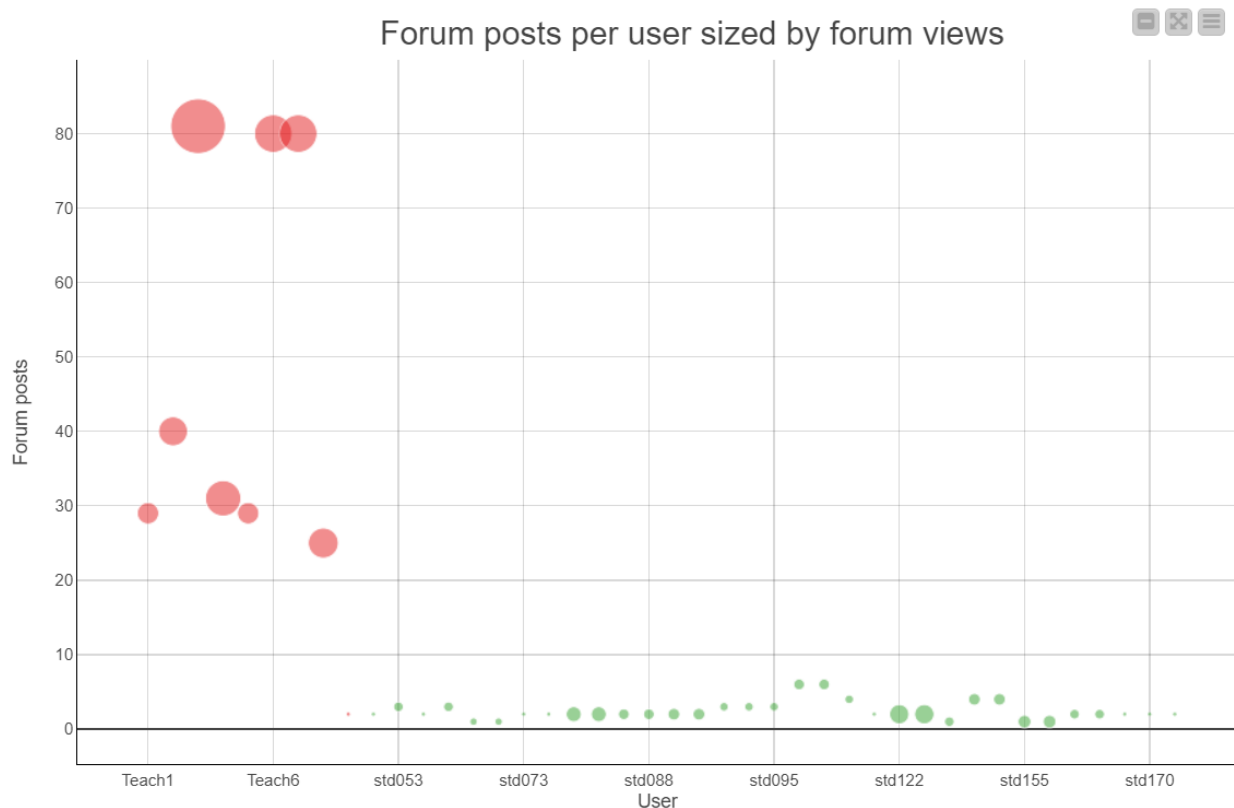
Figure 4: the bubble plot of forum participation for students and tutors.

Since the forum interaction expresses the social behavior of the learning community, it was considered appropriate to embed Social Network Analysis (SNA) metrics and representation in the dashboard. In figures 5 and 6 the interaction of students and tutors through forum posting was visualized. The networks that were created are one-mode, undirected networks, meaning that there is one type of node that represents a forum participant and the connections between them are reciprocal. Two nodes are connected if these two participants have posted in a common discussion thread. The edges that represent the links between participants are weighted indicating the frequency of posts in a common discussion. An edge-related feature of a network is edge crossings since it affects the ease of reading and the interpretability of the networks' structure (Huang et al., 2005). Several algorithms are available regarding the positioning of the nodes and the presentation of the corresponding edges, providing a different view of the network and focusing on different features of its structure. Therefore, two graphs were created to depict forum interaction.

The first network visualization shown in figure 5 was created in a circular layout. In a circular layout, the vertices are evenly spaced which gives the form of a regular polygon. The vertices are placed on the circumference of the embedding circle and the edges are depicted as the chords of the circle (Rani & Shokeen, 2021). This visualization mainly serves the purpose to inform about the number of connections each node has and to who is connected. The magnitude of each node is reciprocal to the number of posts that this participant has made. As Figure 5 shows, the tutors are more active than the students. Additionally, there are bonds between tutors and their students, indicating the supporting role, and bonds between peers, showing that students are beginning to collaborate using the forum community. However, the bonds between peers are significantly less. This fact led us to the conclusion that the level of dependence on the tutors' contribution is still high and this learning community has a long way to gain its autonomy. The low density of the network and the fact that

there are several unconnected areas mean that this network does not present a small world effect where almost all of the participants are interconnected, which would allow a quick information flow.
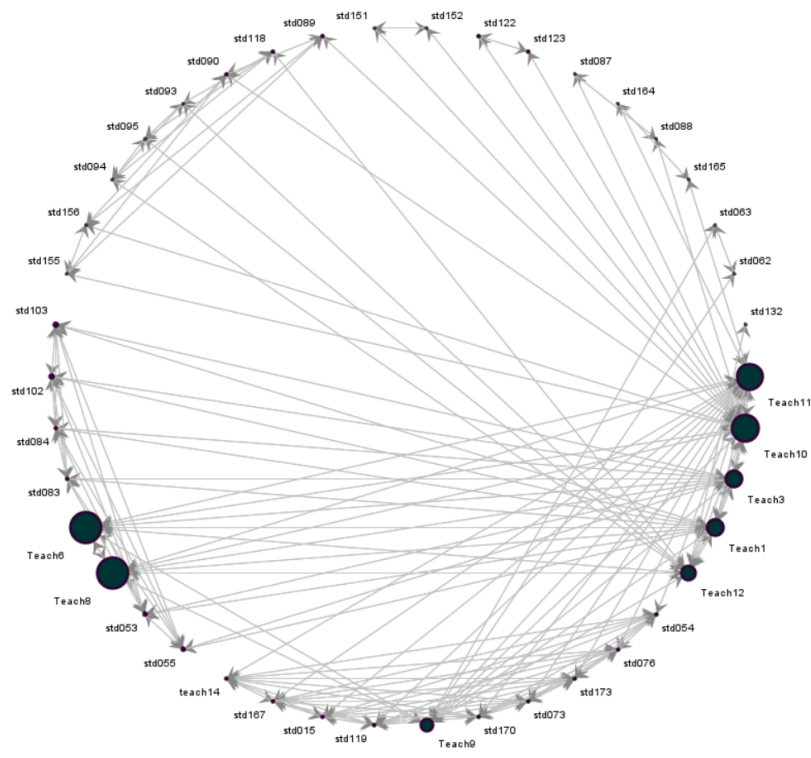
Figure 5: Forum interaction network (Circular layout)

Although the first graph provides a clear view of who is connected with whom and whether the is a small world effect or not, there is less information about the structure of the community and the roles that participants have in the interaction. Hence, a second graph of the network was used. Figure 6, it is shown the same network using the Kamada-Kawai layout (Kamada & Kawai, 1989) for its visualization. It is a force-based algorithm simulating a dynamic system that tries to reach a minimum-energy state resulting in a clear and well-positioned graph (Powell et al., 2005). The nodes that represent tutors are placed in the most central positions, confirming the findings that were previously discussed. There are concentrated in different areas, each one of whom is connected to a certain tutor, indicating that students act mainly with peers from the same class.
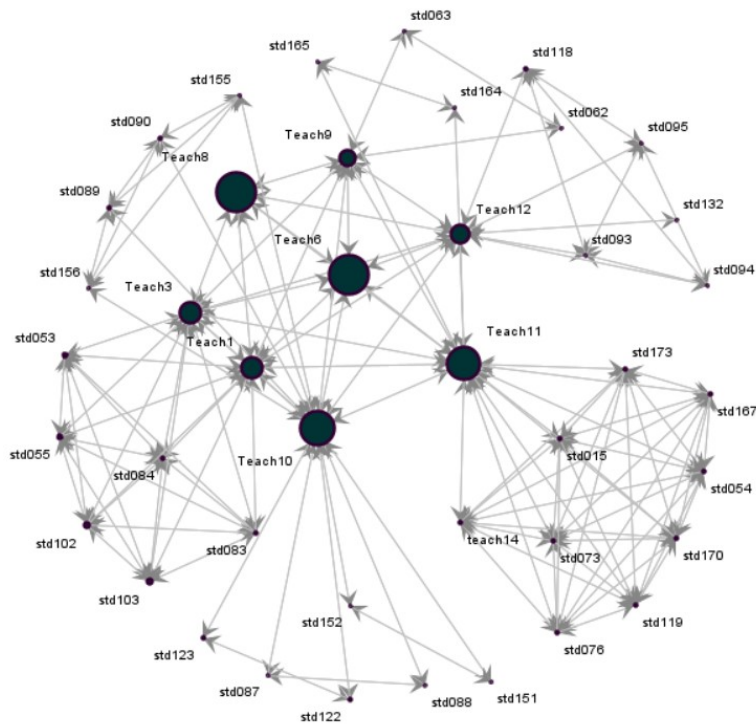
Figure 6: Forum interaction network (Kamada-Kawai layout).

Although the network graphs provide rich information about the social interaction of the course participants, the use of network metrics is important for improving our understanding of the learning process. A parallel line plot was used to illustrate the main SNA metrics. In a parallel line plot, every row is ploted horizontally. Therefore this plot cannot support a large number of rows without quality loss concerning its readability. A separate axis is used to represent each feature. All the axes are equally spaced and parallel to each other. Different scales and units of measurement can be used on each axis. The main advantage offered by the parallel coordinate plot is the representation of high-dimensional data as a 2-dimensional visualization. The line created from our data allows us to easily perceive the trend shown by data entries from the visualization.

In figure 7 students are represented with green lines, while tutors are represented with red lines, arranged on the first axis. The first metric shown in the second vertical axis is closeness centrality. In simple words, the closeness centrality shows how many "hops" are needed so that a node can reach other nodes (Tsoni et al., 2022). Thus, a node with high closeness centrality is a central node in the network. Tutors who are connected to many students and colleagues have a high closeness centrality and additionally, they are placed in the center of the network in the Kamada-Kawai layout. The ranking of the students according to their closeness centrality shows that there are some more active and socialized students who present closeness centrality similar to that of the less active tutors.

The node weight sum metric represents the total number of messages that a participant has posted to the forum. Figure 7 indicated that this metric provides different information about forum participation than closeness centrality. For example, teacher9 and std055 have the same value of node weight sum, meaning that they made the same number of posts, however, teacher9 has higher closeness centrality that indicated that she/he has interacted with more participants and she/he is placed in a more central position in the network.
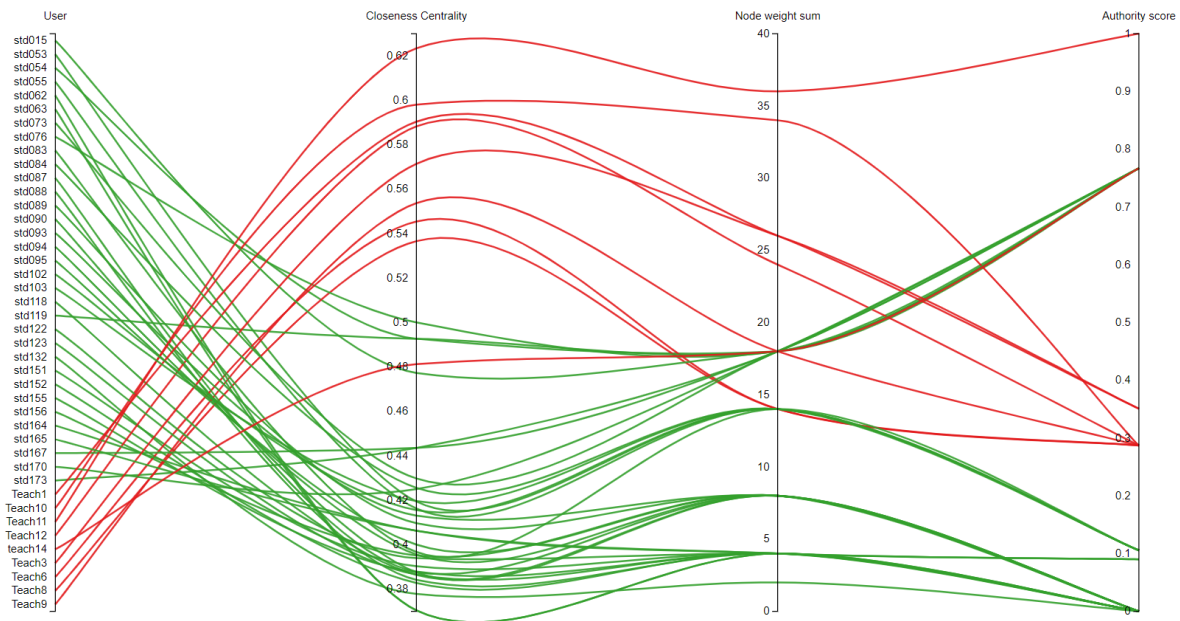
Figure 7: Parallel coordinates plot for main SNA metrics.

Finally, the authority score is a more elaborated metric deriving from the HITS algorithm which aims to capture the influence of a node on a network. A node of high authority score represents a person of high impact in the forum community, who gains importance as the importance of her/his neighbors, rises. Hence, the students who appear to have high authority in Figure 7 are those who prefer to communicate with tutors or other highly influential students. On the other hand, tutors with low authority scores may have a lot of connection with a participant in the periphery of the network.

5. Conclusion

In Distance Learning, it is essential to leverage in optimal ways the information that is produced from learning actions. The better our understanding of learners' behavior becomes, the more we can improve learning design, learning materials, tutoring and support. In this work, we describe a LA method that incorporates data pipelines for creating LA dashboards focused on students' social behavior. We showed that important features about students' and tutors' social behavior and students' achievements can be reported to educational stakeholders via dashboards enabling evidence-based decision-making.

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Designing digital educational games based on literary texts: the educational aspect

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Abstract

From their early days, escape rooms have become a popular form of entertainment aimed at a wide age range, but especially young adults. At the same time, the rapid growth of the digital games industry and the increasing engagement of people with digital technology has led to the creation of a new hybrid type of escape room, the digital escape room. In addition to their purely recreational character, digital escape rooms quite often exploit an educational dimension and are aimed at a more specific audience that wishes to combine entertainment with learning. This paper reflects the rationale and development methodology of the project "Escape through Culture", that concerns the design and development of digital educational escape games aimed at creating a cultural but at the same time educational experience for the player. Based on the triptych: digital educational escape game, literary text, cultural landscape, the project "Escape through Culture" integrates in its thematic framework cultural points of interest in Greece, as well as relevant literary texts and targets a bilingual audience in order to recreate and educate (Galani et al., 2022). Thus, aboard the "vehicle" of literature, the player has the opportunity to explore different regions of the country. This exploration is both playful and educational and is based on an organized scheme of escape room quests and puzzles, remote / virtual and live / in situ tours whereas the digital escape room infrastructure is suitable both for mobile devices and PCs.

Keywords: digital educational games, escape games, literary texts.

1. Introduction

According to the international literature, the design of digital games has significant advantages that turn them into valuable educational means for the development of a wide range of cognitive, practical and social skills (Girard et al., 2012). And although their effectiveness in education has not been fully confirmed (Wilson et al., 2009), researchers and educators appear increasingly convinced of their potential in the educational process since the causal relationship between student's personal involvement in the educational process, intrinsic motivation and learning is pedagogically well known.

The educational experience of the players in "Escape through Culture" takes place in 3 layers: (1) In space: the digital games produced utilize the dual character of the space as a cultural landscape but also the space - landscape as presented with augmented/virtual reality technologies. (2) In literary texts: the selected texts of Greek writers support the sense of place and the multi-sensory involvement of the user, through the context of space-time, language and cultural characteristics. (3) In the philosophy of the "escape game" tool: whether played in a computer environment, indoors or outdoors, the spatial experience is one of the key components of escape games.

The innovation of the project lies both in the junction of Augmented/Virtual Reality with the promotion of educational/cultural points of interest, as well as in the interactive, gamified practices of literary texts.

"Escape" project is implemented by a consortium of three partners: CTI, LECAD and APPOPLOO and co-financed by the European Regional Development Fund of the European Union and Greek national funds through the Operational Program Competitiveness, Entrepreneurship and Innovation, under the call RESEARCH – CREATE - INNOVATE (project code: T2EΔK-02992).

2. Digital educational games

In recent decades, digital games have established themselves as the main choice for leisure time. The growing number of digital games available and the turnover of the video game industry[1] can be used as an indication of the growth of digital gaming, while online games are contributing more to the spread and establishment of this activity.

Digital gaming is intertwined with the concept of play as an inherent tendency and a fundamental element of human culture. In his book Homo Ludens (1938) Huizinga defines play as: "a free activity consciously 'non-serious' but capable of absorbing the player to an intense and absolute degree. It is not connected with any material interest and no profit can be made from it. It develops within its own limits of time and space according to specific rules and organization. It promotes the creation of social groups which tend to surround themselves with secrecy and differentiate themselves from others either through disguise or by other means" (Huizinga, 1938, p.13).

Digital games fall into the broader category of games. They retain the basic characteristics of non-digital games, combining them with the capabilities of digital media. In this context, digital games:

- Are governed by rules
- They encourage competition
- They are based on voluntary participation
- Provide multimodal stimuli to the player

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[1] https://www.statista.com/topics/868/video-games/#dossierSummary

- They allow the player to input data into them
- Manage digital data according to specific rules and provide feedback to the player.

Focusing on the technological features of digital games, Salen and Zimmerman (2004) point out the following:

- Direct but limited interaction: interaction in digital games is an inherent feature of digital games, but it remains a process subject to several limitations mainly related to technical issues (hardware, software) as well as design issues.
- Ability to manage information: Digital games are a medium created from data and managed in a variety of ways. Very often they include a wealth of text, images, video, audio and other forms of stored information not found in physical games or other media.
- Automation of complex processes: This feature is perhaps the most distinctive characteristic of digital games and they make many processes feasible that could not happen without computers.
- Network communication: It is an important aspect of modern video games that, following the spread of the Internet, provides the possibility of communication between players from different geographical locations. These players share a number of social digital spaces, thus significantly enhancing the inherent socialising role of the game.

In the field of tourism and education, it seems that the time has passed when tour operators designed tourist routes, or teachers designed a narrative in order to introduce tourists or students respectively to a place. Technologies such as augmented and virtual reality are widely used to analyse data and leverage the experience of other participants in designing personalised experiences. At the same time, the evolution of technology is increasingly inspiring game designers to develop innovative gamification applications in different environments and for different purposes directly influencing the travel, tourism and education sectors where similar approaches are being adopted by industry professionals as part of their strategy - i.e. to foster a new, playful and fun approach to entertainment and education (Weber, 2014).

Geolocation and augmented reality capabilities are being combined through playful applications and are increasingly being used in tours of archaeological sites, cities, theme parks, airports, restaurants and elsewhere. With regard to the cultural landscape in particular, gaming enables visitors to connect through quests and quests with the history of the past and offers new opportunities to gain knowledge by enhancing the visitor experience (Weber, 2014).

However, two different trends can be identified in the theoretical debate and literature in the field of culture regarding the role of new digital technologies and how they affect or redefine the cultural experience of visitors. In one trend can be summarised by the views of researchers who argue that new technologies, although useful, 'do not recognise more personal and subjective ways in which audiences perceive exhibits and construct (appropriate) the meanings necessary for their full interpretation' (Μπούνια et al., 2008: 156). According to Kus (1992), the reconstruction of a past cultural meaning is only possible through the body and lived experience in the field (Bourdieu, 1977). In other words, a correlation between body (e.g. bodily sensations) and material objects (e.g. cultural landscape) is required, a correlation that is not proven to be sufficient through fictional images, 3D representations and, more generally, digital representations.

In the second trend, without underestimating the role of physical experience as a determining factor in ensuring an authentic (lived) association with the cultural landscape, the superiority of digital technologies is mainly found in ensuring the temporality of the experience they offer to visitors and not so much in ensuring the reality of the visitors' experience (Μιχέλη, 2020). Indeed, it has been empirically documented that visiting

a historical cultural landscape is often an open and awkward experience for visitors, which does not provide any functional benefit (e.g. meaning, active reflection, enjoyment) nor does it create any social or psychological orientation (Χτούρης, 2020) but only passive knowledge (Μιχέλη, 2019). In order to ensure an active reflection with the object of study or viewing, it is imperative that the visitor has a "parallel emergence and opening of the horizon of an aesthetic and conceptual reality in order for the sensation to result in an integrated experience" (Χτούρης, 2020: 6). Therefore, in order to adequately address the different correlations between visitors and cultural landscape and the different 'qualities' of cultural experience, it is recommended that the framework of action in the construction of this experience should respond to the search for the expansion of the spatial and temporal horizon (Μιχέλη, 2019).

Considering the above, the "bet" of the project is whether technology can contribute to culture and education through playful approaches to space.

In this context, the creation of digital escape games is based on the digital processing of literary texts with the support of augmented and/or virtual reality technologies. In particular, the digital-cultural experience of the player in the digital escape game "Escape through Culture" takes place through the layers of literature, space (and time), the cultural landscape, i.e. a "hyperspace" where the additional dimensions constitute the interpretative parameters of the game and the user's engagement.
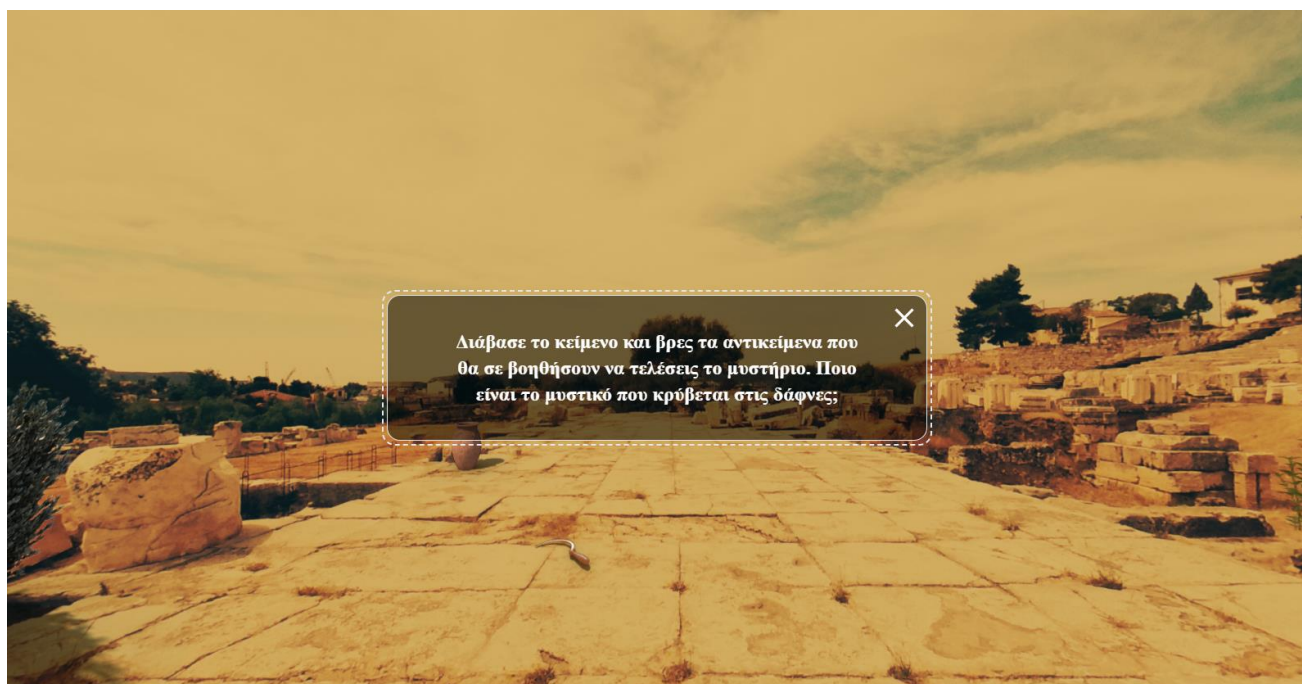
Figure 1: The desktop version of the game.

3. The use of literary text and the geographical foundation

From an anthropological point of view, literature is an expression of human culture that includes the element of play. More specifically, according to the Dutch historian Huizinga (1938), literature is a cultural element that maintains its playful origins. It resembles a game governed by rules that vary over space and time by placing its participants in another world inspired by the real to encode and interpret it.

Considering this, the challenge that the creators of the game had to face was the connection between landscape and literature and the combination of these two variables so that literature leads to landscape, and landscape emerges through literature.

When we refer to space, we mean the entity that:

- is composed of the natural environment and human intervention in it;
- has a vital element of historical evolution;
- plays an essential role in public interest in cultural, ecological, environmental and social life, and
- is a unifying link between the environmental and spatial components of a place (Beriatos, 2007, pp. 58 - 64).

The term ''cultural landscape'' has taken on distinct meanings over time as it developed in geography and spread to other scholarly disciplines. This significant disparity of meanings has vastly enriched the contemplation of the relation of humans to their environment. Many researchers focus on the study and explanation of the landscape itself, while others focus on how we see it, considering human ideas, attitudes, and aesthetics. The landscape is interconnected with a place's social, productive, environmental, ethnographic, historical, and cultural elements. As such, it evokes and highlights links with it, which are reflected in what is called ''sense of place''. Hence, it is considered a ''hyper-space'' that extends beyond the three dimensions with the additional ones constituting the interpretative parameters of the landscape and changing according to the interpreter (Kizos, n.d.). The cultural dimension and value of the landscape are closely linked to the human presence in the sense that Pikionis (Emotional Topography, 1935) refers to "the spirit that emerges from the places". The Greek landscape, which has a leading role in the current project, follows and reflects the country's developments with rich historical signs and profound transformations due to human interventions, which have left strong traces, sometimes in the form of degradation, sometimes with respect and sensitivity.

The cultural landscapes we deal with in this project are landscapes that have been shaped by human engagement. They are geographic areas (including both cultural and natural resources) that are associated with historical events, activities, or individuals, or have any other cultural or aesthetic value. Given the function of the narrative as an innate need for communication of human thoughts and as a key element of literature, this digital escape game focuses on site-related literary texts as a vehicle for the player's acquaintance with geographical regions of Greece and treats the narrative not only as a starting point, but as a living part of the game, which enhances the player's immersion. In this way, the literary text narrative acts as a "canvas" on which the player's personal quests and trips in the space and time of the game and the cultural landscape are developed. Space, one of the critical features of escape games, in this digital game, takes on a multifaceted role as it is treated as:

- the space-landscape of the present day referred to in the literary text (now);
- the place-landscape to which the literary text refers at the time described in the text (then);
- the physical space of the player's presence (in situ, indoors or outdoors);
- the virtual space as experienced by the player through the digital tour;
- the space -landscape as shaped by augmented and virtual reality technologies.

The dialogue between space-landscape and literature in this game, regardless of time, is particularly intense and sustained, since, with the help of technology, all the game's challenges arise from the combination of the two. The significance of games in landscape's construction involving the feedback relationships between social

conventions and the individual and between the individual and physical space, contrastingly, is attested by recent studies (Kühne et al., 2020). Similarly, the added value of remote cultural experience served by the games is claimed by Holden (2015), especially in the case of the COVID-19 pandemic (Galani et al., 2022).

As mentioned above, the literary text is a functional and structural element in the game. It is the starting point from which the player starts to wander around the space and get to know it. It is the link between the player and the space simultaneously but it is also the starting point of the narrative and the action. This is mainly due to the function of the literary text. On the one hand, it functions as an act of communication where a series of events, real or fictional, are presented, and on the other hand as the product of the narrative process itself. In both cases, it is an element of cultural expression, whether placed in the literary-world sphere or in the real world.

An interesting observation regarding the conflation of geographical places/cultural landscapes and literature is their common characteristic: diversity. In particular, the diversity of literary genres results in significant differences between poems and prose in terms of their approach to landscape. Poems, being much more abstract than prose texts, expand or even freeze time and therefore capture the place in its diachronicity. In contrast, prose texts, by following, as a rule, the realistic condition of narrative, depict a much more recognizable place within fairly limited coordinates (Modinos, 2015).

Similarly, the place of the landscape in the narrative is multifaceted. At times the landscape is a simple stimulus, whereas occasionally, it is a central element of the narrative. In some cases, the landscape is a single setting in the literary narrative, while in others, the narrator's landscape is treated in contrast to that of the event being narrated, or even as one of a series of different landscapes in which the narrative unfolds (Prince, 1989).

In order to achieve the promotion of Greek literature and its connection with the cultural landscape in this project, we use Greek original and translated literary texts (prose and poems), which are harnessed for the virtual gamified acquaintance of the player-visitor with the cultural landscape of various geographical regions of Greece. The selection of literary texts is based on the consideration of the landscape either as a setting in which a story unfolds or as a stimulus for recalling memories and other thoughts. The selected texts of Greek writers were drawn from ''Photodendro''[2], the national aggregator of educational content. At the same time, where necessary, other literary texts, or other types of texts that have a complementary role in the digital game, have been selected as well.

A general methodology for the compilation, processing, analysis and semantic annotation of the literary texts deployed in the design and the development of the core elements of the digital escape games, i.e. scripts, digital ''escape rooms'', challenges-puzzles was developed (Papadopoulos et al. 2022; Mantzari et al. 2022). The steps taken subsumes the following:

- The compilation of the Escape through Culture general corpus, which led to the creation of ''The Geography of the Greek site-related texts in the textbooks'' (http://escape.cti.gr/en/map), an interactive map which depicts the geographical locations where the stories of the selected texts take place (Figure1).
- The processing and analysis of the texts relevant to each geographical location, which involved both distant-reading and close-reading analysis performed through the use of web-based tools, such as the Voyant tools (Platte, 2017) and Sketch Engine (Kilgariff et al., 2014). Using these tools, we have generated lists of collocations (words that repeatedly occur near each other) whose study was helpful

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[2] http://photodendro.edu.gr/aggregator/?lang=el

for the thematic study of the literary texts, i.e. identification of words or phrases related to the cultural landscape.
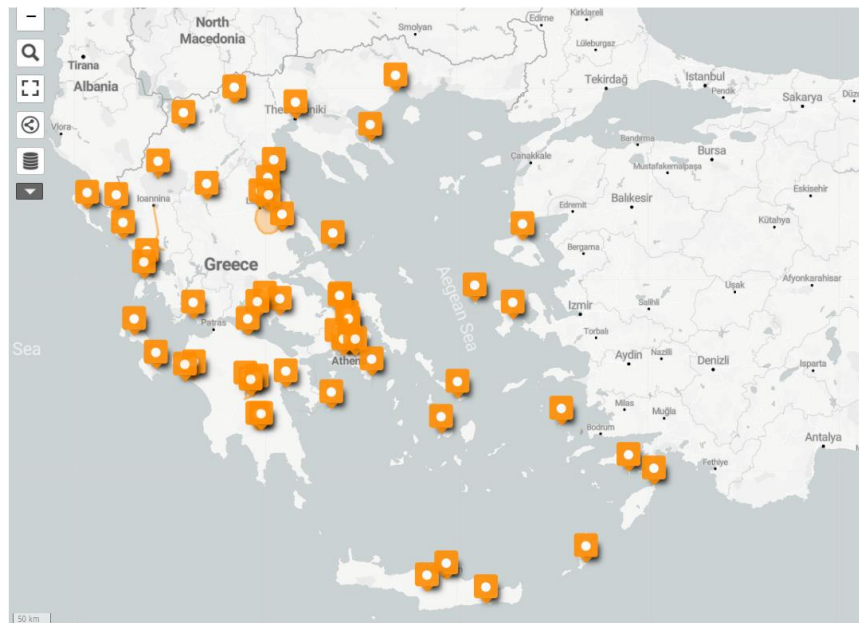
Figure 1: The Geography of the Greek site-related texts in the textbooks.

- The development of a taxonomy of key concepts/topics related to the cultural landscape that has been used for the semantic annotation of the literary texts. The taxonomy for the cultural landscape is based on the general approach claimed by Andrzejewski & Salwa (2020), an alternative theory of landscape grounded on the experience, and subsumes a body of concepts that are vital to the history as well as to the current state of the landscape (e.g. points of interest related to the natural and man-made environment, modern buildings, archaeological sites, historical monuments, industrial buildings, imaginary and mythological places, persons, mythical or fictional entities, and events) (Alves & Queiroz, 2015).
- The semantic annotation of the literary texts was performed using the ANNOTATE function of CATMA, a web-based application for computer-assisted text mark-up and analysis [Horstmann, 2022]. Chunks of the literary texts were identified and assigned with the taxonomy tags that illustrate the different types of the landscape as mentioned above. The annotated chunks were harnessed in the design of the diverse digital escape rooms, aka in the 360° panoramas, and in the development of the puzzles that the users are asked to solve based on the information hidden in the relevant excerpt of the literary text.

An example of how the cultural landscape emerges from the literary text and how the virtual gamified acquaintance of the player-visitor with this landscape is accomplished in the desktop version of the game for Eleusis, is illustrated in Figure 2 and Figure 3. In the following excerpt, taken from Yannis Ritsos' poem ''Persephone'', which is inspired by the myth of Persephone, the predominant image emerging is that of the refugees, who were forced to flee their homes in Asia Minor and arrived in Eleusis in 1922 and 1923. The picture of the refugees on the pier of Eleusis with all their property in one luggage reminds the Persephone, who, according to the myth, after her abduction by her uncle Hades, was obliged to travel from the underworld to up world every six months:

The traveller speaks:

It is true, I tell you – I was fine over there. I have grown used to it. It is here I cannot bear it;
There is so much light-it makes me sick-naked, harsh light; it reveals everything, conceals everything; it changes
so often you cannot keep up; you change;
you sense time slipping away – an endless, wearisome movement;
glasses shatter in the move, are left behind in the street, sparkle;
some people jump ashore, others board the boats; – just as when
our visitors came, went, and others came; their big suitcases sat for a little while on the sidewalk
a strange smell, strange places, strange names – the house
was not our own; – it too was a suitcase containing new underclothing, unfamiliar to us
someone could pick it up by the leather handle and slip away. We were glad then, indeed. A move then seemed
somehow to be a move upward; (Ritsos, Persephone).

For the sake of the game, the mythological landscape concerning the Persephone's movement acquires the significance of the symbol and it is conflated with the historical and social landscape of Eleusis, which at the beginning of the 20th century has received up to 3,000 refugees from Asia Minor. The digital escape room that ''hosts'' the literary text is a 360° representation of an old laid-up boat at the Eleusis shipyard (Figure 2).
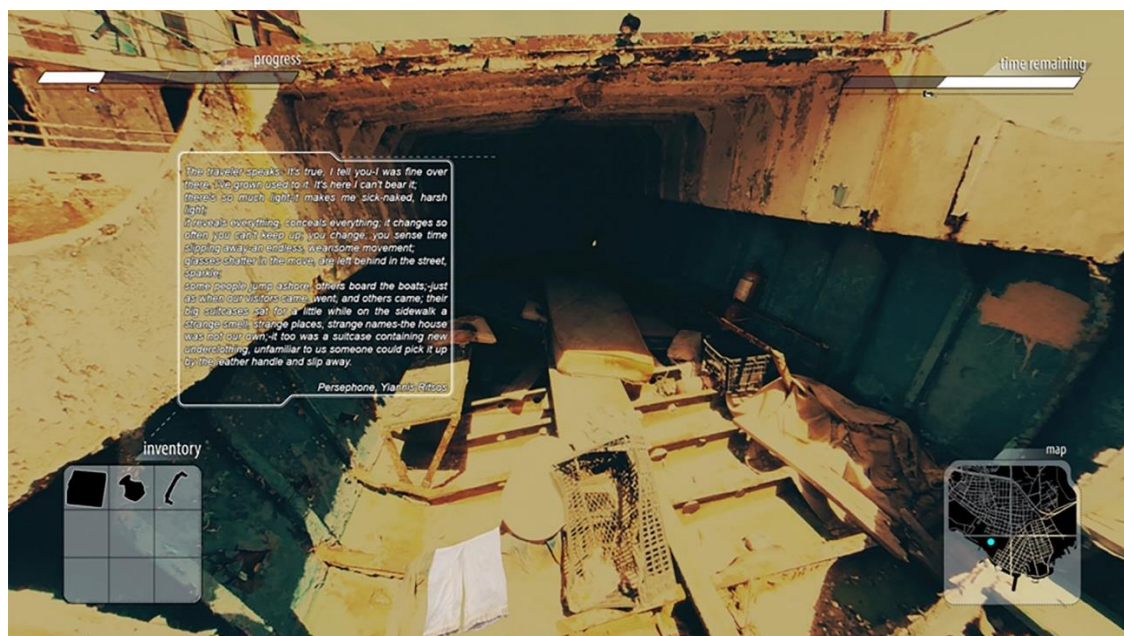
Figure 2: Example of a digital escape room with the literary text.

The clues for the puzzle in Figure 3 encourage the dialogue between the place and the visitors urging them to identify the refugees' property hidden in the boat and put them into the suitcase.

4. The educational aspect

Laying emphasis on user experience (Mc Carthy & Wright, 2004), the "Escape through Culture" escape games are designed with the aim to achieve the player's rich personal outcome while performing the game tasks. Effectively, player experience in "Escape through Culture" games relates to the player familiarization with literature texts while developing the sense of place and making connections with selected pieces of literature. The "Escape through Culture" game environment is designed in order to achieve quality human-computer interactions, and combine the user esthetics and emotions with education and leisure.

Figure 3: Example of a digital escape room with a puzzle clue.

The educational perspective of the "Escape through Culture" game is reflected in various aspects of its design and development, one of which is very closely related to the role of the literature texts as well as to the way in which they have been selected. More specifically, the literature texts that formed the repository of the relevant project, as mentioned before, were mainly collected from the official school textbooks of literature in Greece, reinforcing their educational value and suitability for students of all ages as well as their free and open access. The selection criteria of specific texts were related to their connection with the cultural landscape of certain geographical areas all over Greece. The texts maintain a key role in the game and are being used either in whole or in parts. Along with other textual genres (e.g. newspaper articles, encyclopedic articles, dictionary entries, reviews of literary work, biographies, historical sources etc.) they are used as material for designing riddles, puzzles and other game-like activities or as material that provides additional information regarding various objects and places of interest, especially in the AR versions of the game. Furthermore, educational value is considered to derive from the use of a map of Greece to depict the collection of the literature texts. The visitor of the project website (http://escape.cti.gr/xartis) may click on any of the pins on the map to see the relevant information and quickly visualize, compare and contrast the work of famous Greek authors and poets and connect it with geographic areas and cultural landscapes.

The game riddles and puzzles were also created in order to enhance the educational but also the entertaining aspect of the game. Constituting a key element of escape games, in the "Escape through Culture" game the riddles are encountered as a means for decryption, interpretation of literature texts, disclosure of hidden data as well as for recovery of hidden objects, of objects that are supposed to be sought and found in unfavorable places, and in some cases of everyday objects which can be combined to assembly a larger puzzle. The riddles and puzzles are used throughout this escape game to guide the player through the different rooms that he/she needs to navigate by 'decoding' and 'understanding' literature texts, which are relevant to the specific space, and thus, learn more about the time, the location and the respective literature.

Player experience in "Escape through Culture" associates literature and geographical landscape. Effectively, player involvement and the consequent educational value of the escape game is assisted by the game environment. The structure and the development of the game tasks are designed in order to achieve player

immersion, and the development of "the sense of escaping" from a space, which, although it is not the player's physical space, it becomes evocative. Special effort has been made to harmonize literary texts with the game landscapes and the feedback provided to the player during game play. Thus, in the example of the digital escape room of the old boat (Figures 2, 3), while working with the text of Persephone and solving the game puzzle, the player is given useful clues and gets feedback when he has not put the objects in the suitcase in the right order.

5. Conclusions

The design and implementation of digital escape rooms in the framework of the project "Escape through Culture" is about finding creative and playful ways to highlight Greek literature and the Greek cultural landscape.

The strategic choice of adopting three different game versions, the Desktop version, where the player plays the game in an enclosed space, independent of the literary work's landscape, the Augmented Reality version, where the player plays the game on a portable device in an enclosed or open space, and the Augmented Reality in situ version, where the player plays the game in the literary work's reference site was a major challenge in itself within the project. The design of different digital escape room versions emerged from the study of the potential player's needs. Each version keeps up with different needs and requirements without excluding the possibility of player engagement in all three in any order. It helps the player to cope with the problem of distance, to meet the need to prepare a visit to the site and finally to be able to engage in a playful process of getting to know the cultural landscape.

Practical, technical and conceptual difficulties associated with the use of different technologies in the design of escape rooms relate to the duration of play, the scope and complexity of the activities, the way of presenting the literary snapshot, the different rendering of the concept of escape, the use of a single literary text or multiple literary snapshots, the way of organizing, modelling and developing escape room scenarios, are a small sample of the ongoing development within "Escape through Culture" framework.

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Developing virtual learning environments for engineering education

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Abstract: Developing virtual learning environments for engineering education

The operating environment for engineers has changed in recent years (Vona et al., 2018; ILO, 2019). Energy transition driven by ecological crises creates a need to have a critical look into engineers' skill sets and competencies. The renewable energy sector is one of the most significant ones in terms of new job opportunities and the development of new occupational profiles (ILO, 2019). At the same time, the transition to environmentally sustainable and socially just future creates a growing need for expertise that is different from the traditional technically focused competence profile. The project described in this presentation aims to establish best practices for the creation of digital learning environments in a cost-effective way that is easy to integrate with educational contents. We aim to make use of virtual reality-based learning, develop digital and engaging learning environments, and create a radical new opening to develop education and share best practices with other higher education institutions.

The learning environment is known to have a significant impact on the success of learning. It is effective to practice skills in a real environment, but this is not always possible because it can be inaccessible or dangerous. For example, it is not possible or allowed to take 100+ students to a nacelle of a large wind turbine at the height of 150 m or in an underground thermal storage cave. Virtual site visits are also cheaper, reduce the need for traveling, and therefore, decrease CO2 emissions, and make learning flexible as the materials can be reached at any time convenient for the students.

Virtual learning environments are recognized as viable tools to improve engineering education and training and have been developing rapidly in recent years (Wang et al. 2018, Hirvonen 2021). The use of virtual reality tools allows, for example, easy-to-understand visualisation and communication of complex spatial data (Janiszewski et al., 2021; Du et al., 2017). Virtual learning environments provide great opportunities, but they are challenging to create and require specialist knowledge of 3D scanning, VR development, and programming. The challenge is to integrate them with existing educational content.

Educational contents of our project include development of showcases of virtual reality-based learning tools for effective teaching of engineering. Two virtual learning journeys will be demonstrated. One is related to renewable energy engineering. Rapid energy transition challenges us all, also energy engineering education. This requires whole new kinds of learning tools. We will showcase an onshore wind energy site. Along the virtual journey, the student is introduced to technical solutions as well as ecological and social sustainability considerations. The second educational content is about scaling-up existing virtual reality learning systems for rock engineering and engineering geology teaching developed as part of the Aalto Online Learning's MIEDU, EDUROCK, and COVE pilots (Jastrzebski, 2017; Janiszewski et al., 2020a; Zhang, 2020). This knowledge can further be used to develop a demo on underground thermal energy storage. An example is a virtual rock and mineral database that has more than 100 samples digitised from the university's collection (EDUROCK, 2019). Test results show that the use of this virtual material enhanced the learning outcomes by 20%.

Finally, there will be an evaluation of the student experience and analyses of the pedagogical aspects done. A very important part of the project is to make sure that the tools and materials are pedagogically relevant and support the intended learning outcomes logically. The focus is on developing flexible and engaging teaching scenarios to achieve learning goals. Detailed workflow descriptions of the processes will be developed and published.

Keywords: virtual learning environments, education, photogrammetry, 360° photos and videos, renewable energy, sustainability, onshore wind power

1. Introduction

The operating environment for engineers has changed in recent years (Vona et al., 2018; ILO, 2019). Energy transition driven by ecological crises creates a need to have a critical look into engineers' skill sets and competencies. The renewable energy sector is one of the most significant ones in terms of new job opportunities and the development of new occupational profiles (ILO, 2019). At the same time, the transition to environmentally sustainable and socially just future creates a growing need for expertise that is different from the traditional technically focused competence profile. A new competence profile could include for example environmental engineers with a focus on nature restoration or industrial ecology where industrial systems are designed to resample natural ecosystems (ILO, 2019). This requires that new kinds of learning methods and materials need to be developed for energy engineers. Focusing on a techno-economic optimum alone is no longer enough. There is a need for experts that understand the ecological and social challenges related to energy transition. We need game changers who, for instance, can combine biodiversity considerations into energy planning so that while greenhouse gas emissions are reduced, further deterioration of nature is prevented. The project described in this paper is a response to the need for interdisciplinary sustainability education for energy engineering students with the use of virtual learning environments.

The learning environment is known to have a significant impact on the success of learning. An engaging digital learning environment for engineering education has clear advantages (Wang et al., 2018, Hirvonen, 2021). Learning results have been found to improve when utilizing virtual reality (VR) and the motivation and engagement of students have been found to be higher (Puranen, 2019). Students can go back in the lesson, review the current exercise, or move forward at their own pace. Teaching is flexible and can take place when the student has the time. Research shows that this is the most effective approach, but the teacher cannot do this with every student, but only one at a time. A virtual learning system solves this by providing each student with a personalized learning experience, which enables the capability to teach more students. The advantages of using virtual learning environments are also evident in cases when it is not possible, safe, or allowed, to make real site visits. For example, it is not possible or allowed to take 100+ students to a nacelle of a large wind turbine at the height of 170 m. Another benefit of the use of VR is the possibility to reduce costs in a long run. The need for expensive investments in laboratory devices, field trips, and faculty is reduced (Abichandani et al., 2014, Kumar et al., 2021).

Virtual reality allows also an easy-to-understand visualisation and communication of complex spatial data, or the integration of interdisciplinary topics, like sustainability considerations of renewable energy developments, in one place in an activating and visual way (Janiszewski et al., 2021; Du et al., 2017). Different scenarios, including techno-economic and socio-ecological considerations, can be discussed and visualized in one place. Another advantage of using virtual reality in education is to simulate learning environments so that repeatable and measurable interactive teaching can be developed. Virtual visits are also cheaper, they reduce the need for traveling and therefore, decrease CO_2 emissions, and make learning flexible as the materials can be reached at any time convenient for the students.

This paper gives an overview of our project to develop and implement advanced virtual reality tools for learning sustainable renewable energy system design. The project will produce shareable and replicable virtual materials and related documentation that allows the use and potential further development of the created systems.

2. Methods

This project aims to establish best practices for the creation of digital learning environments in a cost-effective way that is easy to integrate with educational content. The project addresses the aim of developing a digital and engaging learning environment, and a radical new opening to develop engineering education.

Virtual learning environments are either modeled from scratch, recorded on 3D videos, or scanned. The last two methods are preferred for truly immersive virtual learning environments. In this project, virtual learning environments are developed with the use of 360° videos and photogrammetry. The project will make use of the 3D virtual environments developed by Uotinen et al. (2019) and Janiszewski et al. (2020b) in rock engineering where virtual learning systems based on scanned real environments were created. We will develop two, scalable examples, one on renewable energy and sustainability education and another one on rock engineering and engineering geology.

The first example tackles the needs arising from the ecological crises and rapid energy transition challenging us all, also the energy engineering education. New types of tools and new kinds of materials, such as the ones developed in this project, are needed to address better the technological, economic, ecological, and social intersection where sustainable energy transition should happen. We are developing a virtual learning journey for an onshore wind energy site (Figure 1). This journey combines technical learning with ecological and social sustainability considerations and data. The aim is to give the students a visual learning experience highlighting the different sides of an onshore wind energy project. This work makes use of Mika Järvinen and Hanna Paulomäki's ongoing work to produce an international, multidisciplinary textbook for energy engineers learning[1]. The substance collected for the book, and the experience gained will be turned into materials to be used in virtual learning environments.
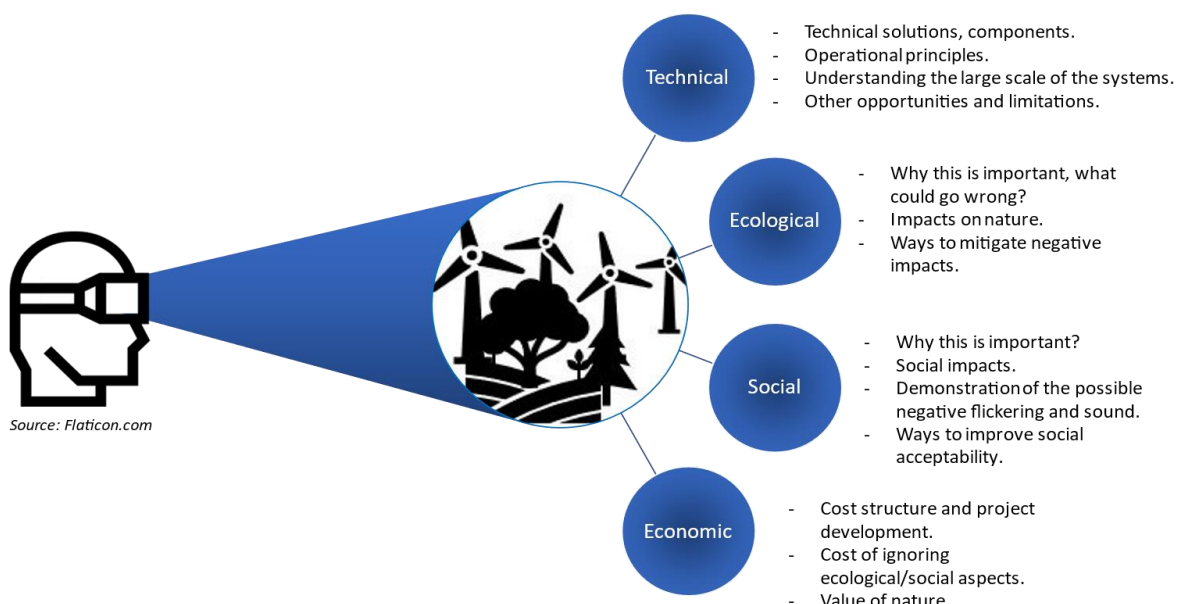
Figure 1: Conceptual sketch of the 360° video learning environment, wind power as an example case.

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[1]   https://www.aalto.fi/en/news/urgent-need-for-talent-and-skills-environmental-problems-require-interdisciplinary-solutions

360° photos and videos were chosen as a primary tool for the virtual learning environment since this option can provide the virtual site visit experience and can be combined with the learning goals we want to achieve. 360° materials are also quite time-efficient, cheap and an easy way to start exploring and implementing virtual reality experiences into teaching since they do not require very specialized (programming) skills (Hirvonen, 2021). For shootings, a VR specialized camera, Insta360 TITAN (Titan), and a VR microphone, Zoom H3 VR have been used. Titan is a professional-level VR camera with 8 cameras and the ability to shoot up to 11 K videos and photos. This enables the creation of an experience that could be explored by both 2D displays and by different VR glasses, the expensive and cheap ones to support the wider implementation of the use. The created virtual reality will provide a virtual site visit to an onshore wind power plant and introduces technical, economic, ecological, and social considerations related to the development of such energy production site. The virtual material is meant also to motivate the students and help them to create a comprehensive view of a wind energy project, including also sustainability aspects. To date, the 360° video production is in the post-editing process and the first versions of the VR site visits are already being tested by students.

The second example is a fully immersive VR learning environment for rock engineering and geology education built using high-resolution photogrammetry. The Aalto University test tunnel is located beneath the Otaniemi campus in Espoo, Finland. The tunnel is a unique research and teaching environment where students can practice field mapping in a realistic setting. However, the time that students can spend underground is limited which restricts their active learning time. For this purpose, a virtual learning system has been built by digitizing the tunnel and developing immersive and interactive exercises that are aimed to enhance the current teaching activities. The real teaching environment has been digitized into a photorealistic 3D model. A high-resolution digital single-lens Reflect (DSLR) camera was used to collect a set of overlapping photos of the tunnel and a 3D model was reconstructed using Reality Capture photogrammetric software. The 3D model was optimised to be viewed in both PC-tethered and mobile VR headsets. The model was then implemented into an interactive learning environment built in a 3D game engine. The user can explore the virtual environment by teleporting and moving around in real life. Special virtual replica tools were built so that field mapping data can be collected by the user. The user is training first in VR, before practicing in the tunnel in real life. The previous study has quantified an improvement in learning outcomes due to practicing first in the virtual tunnel (Janiszewski et al., 2020). As a next step, the virtual learning system was gamified to allow for a self-paced virtual exercise in a game-like setting, where the user receives instant feedback on their performance (Janiszewski et al., 2022). The same digitization method utilizing high-resolution photogrammetry will be employed to scan an underground thermal energy storage facility constructed in a rock cavern in Finland. The aim is to build a virtual learning environment and teach the user about both the energy engineering concepts and the rock engineering principles for building underground heat storage facilities. This example links the renewable energy and rock engineering perspectives in an immersive and stimulating virtual learning environment.

Finally, an evaluation of the student experience and analyses of the pedagogical aspects will be done. A very important part of the project is to make sure that the tools and materials are pedagogically relevant and support the intended learning outcomes logically. The focus is on developing flexible and engaging teaching scenarios to achieve learning goals. To make this work replicable, detailed workflow descriptions of the processes will be developed and published. The objective is to teach other teachers how to film 360° videos and scan environments into 3D models and turn those into online teaching materials. An example of this is our virtual geological sample set developed in the EDUROCK project which has reached 190 thousand views globally (EDUROCK, 2022).

3. Conclusions

This work is still ongoing, but we can draw some preliminary conclusions that might be of help to anyone else planning to start such a project. Virtual reality has multiple advantages as a learning environment: one great advantage is to "open" 3D models in the virtual environment and see inside complicated devices or visit places that might not be possible to visit in the real life (Kumar et al., 2021). This is especially an interesting feature in the engineering field since it gives an opportunity to increase the understanding of the functioning of complicated machines and complex systems in the environment they are operating. We want to give the students "a real feel" and a "wow-effect" by bringing them into the virtual reality learning environments.

Three features characterize the nature of virtual reality: immersion, interaction, and imagination (Burdea and Coiffet, 2003). Immersion means the feeling that the user is inside the artificial world and feels involved in the world. This we will do by taking the students into a real-life, operating wind power plant. They even have the possibility to look at the view from on top of the nacelle and experience how the ready project is perceived in its environment. Interaction instead means that the user can interact and communicate with the artificial world and the world responds to this interaction. This is manifested through the ability to move around in the virtual environment and select from different information boxes, short videos, and exercises. Both interaction and immersion play significant roles in this VR application. The explanation of imagination is a bit more abstract: imagination gives virtual reality the possibility to be a solution for any kind of human problem, like medical problems. With this journey, we want to shake the students to expand their view from a purely techno-economic approach into wider sustainability thinking.

However, the price of suitable hardware and software is still a limiting factor for the wider use of VR in learning. Also, there are additional costs that stem from other operation-related costs like support, maintenance, and training of people to use, maintain and develop the system (Kavanagh et al., 2017) that are needed to use the VR effectively. The production of virtual reality material and content can be challenging. If there are no resources to purchase expensive ready-made solutions, content must be developed in-house: a person with game coding skills is needed to program a 3D environment, or equipment for making 360° videos need to be purchased. Often this means balancing between limited time and financial resources. Therefore, instead of aiming for advanced and completely realistic experiences with too few resources, often it is better to focus on creating a simpler, but functioning virtual reality experience (Kavanagh et al., 2017).

One important issue to consider is if VR has a real effect on the learning process. Some studies have shown positive effects on the learning process of students when using VR due to motivational matters, but Puranen (2019) mentions that there is no clear evidence of the usefulness of the use of VR due to the novelty of the technology. Students can be so attracted by the technology that they don't consider the information they are given (Jensen and Konradsen, 2018). Kumar et al. (2021) noticed the same issue in their study: short-term learning profits had been considered in the literature, but there was a lack of discussion of long-term effects. Puranen (2019) also stated the demand for new research on understanding if VR is a preferable learning tool for students also on the long run or is it just the attraction of new technologies, and Kumar et al. (2021) as well expressed the need for new research of benefits between traditional teaching and VR teaching.

In this current project, we aim to develop a virtual reality teaching model by creating a set of whole new kinds of learning materials in a way that is replicable and scalable. All phases and user experiences will be carefully documented giving qualitative data that will be turned into user-friendly documentation. We are especially interested in how virtual reality is utilized and can be used in energy engineering and geoengineering education

but at the same time, the aim is to develop methods that can be easily adopted and adapted to other fields of study as well. Regardless of the challenges, virtual reality has shown to be an interesting and progressive addition to the educational toolbox, and we want to study and develop a learning environment that gives additional value to traditional technical energy engineering learning by giving a platform that provides a comprehensive picture of a large, renewable energy project.

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Faculty development model to promote digital educational transformation

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Distance teaching and learning processes, and distant teaching universities are not new, and neither is the rapidly developing world and field of open and digital education. However, in some cases, digital education existed as a niche approach or institutional strategy in some higher education institutions. While the uptake of educational technology in higher education has many benefits and promises, still, until the COVID19- related crisis, many institutions have been only using traditional educational scenarios. The situation seems to have changed during the COVID crisis and related forced and rapid transition to the use of different educational tools; it has been argued that the pandemic has given an unprecedented push towards the uptake of educational technologies, however, the mid- and long-term effects of this uptake cannot be foreseen at this stage. Instead, we could research existing lessons and knowledge from this experience. This could contribute to the understanding of the context, underlying factors, and future perspectives of the uptake of educational technologies for educational transformation and faculty development. Therefore, this contribution offers: (1) A reconceptualization of the barriers to digital education transformation, a discussion and supporting evidence on its state-of-the-art, or the lack of thereof, of faculty development frameworks for digital educational transformation, with the help of a bird-eye view of the field through bibliometric analysis. (2) Conceptualization of networked learning for faculty development as a meso-level venture through the lenses of organizing cognition as the way to respond to the barriers to digital educational transformation. (3) A concluding proposed model under development that aligns with the conceptualization.

Keywords: faculty development, networked learning, digital education

1. Introduction

While technology-enhanced learning or educational technology uptake in higher education has many benefits and promises, still, until the COVID-related crisis, many institutions have been somewhat slow. Distance teaching and learning processes, and distant teaching universities are not new, and neither is the rapidly developing world and field of open education and, namely, MOOCs. However, in some cases, digital education existed as a niche approach or institutional strategy in some higher education institutions. The situation seems to have changed during the COVID crisis and related forced and rapid transition to the use of different educational tools. In the context of K12 education, it has been argued that the pandemic has given an unprecedented push towards the uptake of educational technologies (Bardone & Eradze, 2022; Eradze et al., 2021), however, the mid and long-term effects of this uptake cannot be foreseen at this stage. Instead, we could research existing lessons and knowledge from this experience that could contribute to the understanding of the context, underlying factors, and future perspectives of the uptake of educational technologies for educational transformation.

This paper is an attempt, to first, define the boundaries of digital transformation in education at the higher education level, and understand what the existing barriers and opportunities for such transformation are. As a result, the paper first outlines the barriers to and need for a faculty development in terms of digital education transformation, then outlines how networked learning at a *meso layer* of organisations can address this. A bibliometric analysis shows the scope for more research in this area, leading to a proposal for the Faculty development for holistic digital educational transformation.

2. Background and literature review: Faculty development, Networked Learning and Transformational Digital Education

Historically, researchers name some barriers and possible reasons for the slow uptake of digital education in the higher education context: this includes cost, intellectual property issues, custom and practice, preconceptions, and perceptions (Tynan et al., 2012; Walker et al., 2014). According to one study (Walker et al., 2014), the top four most significant of these have longitudinally remained the lack of time, lack of academic staff knowledge, lack of funding and university and/or department culture. While intrinsic and extrinsic drivers are different across higher education institutions, for instance, it is almost always the case, that the academic faculty are recruited mostly based on research output (Fleck, 2012; Schneckenberg, 2010) and not pedagogic excellence or knowledge. Another most crucial factor is the lack of time and academic workload, where the faculty is involved in many different responsibilities and there is little window for innovation and pedagogical explorations with tools. Moreover, in some cases, when universities do not reward/or do not prioritize the use of educational technologies, the time and effort put into them, the faculty might feel discouraged. However, some studies have demonstrated that the time and effort invested, will save them time in the end (Gregory & Lodge, 2015).

Aside from motivation, the capacity to develop and use different educational tools is related to other factors such as competencies (Schneckenberg, 2010). It is also worth mentioning that early research shows that traditional ICT training courses do not sufficiently motivate faculty to acquire the required competencies and to engage in eLearning. As a result, *"Universities have to create innovative portfolios for faculty development which extend both the scope and breadth of formal training with non-formal measures like communities of practice, peer groups and networks"* (Schneckenberg, 2010).

Another bottleneck is the lack of efficient faculty development schemas and frameworks that unlike at the level of school education, are scarce and frameworks for Faculty Development that target educational innovation or digital education (as demonstrated in the coming chapters) are even scarcer. Even the concepts of "educational innovation" or "digital transformation" in education are quite vague and tend to be under-theorized and under-problematized. As some authors indicate, *"the Covid-19 lockdown experience has put in practice many ideas and principles developed in the field of networked learning"* (Ryberg, 2021). One of the ways could be a networked learning approach also in faculty development. For this purpose, this contribution offers a bird-eye view of the field, a bibliometric analysis, and a research-driven Model proposal in progress.

2.1. Frameworks for HEI faculty development

There are different perspectives and definitions of faculty development. Perhaps the most encompassing is that of Chait and Gueths (Chait & Gueths, 1981) who define faculty development as an "attempt at change" in response to changes to the academic environment, mostly at the normative level. This usually entails an organized, goal-directed process to achieve career progression and growth (Hamilton & Brown, 2003) for faculty members and, as such, plays a key role in both individual and organizational development (Steinert, 2012). Due to its complexity, faculty development entails many factors: Hamilton and Brown (Hamilton & Brown, 2003) describe 38 "core contents" of Faculty Development, ranging from business aspects to individual factors such as work/life balance. More succinctly, the UCD Development Frameworks individuates 16 factors under three main categories: *"Scholarship and Innovation; Teaching and Learning; and "Leadership and Contribution"* (University College Dublin, 2018)

A traditional framework for faculty development, at least in the context of medical education (which is the most developed sub-field of faculty development) is linear (O'Sullivan & Irby, 2011), focusing on the formation of individual faculty members to impact students and trainees to ultimately promote the treatment and wellbeing of patients. To this model, the same authors oppose one based on the *community of practice* framework, in which interaction between two communities of practice (the faculty development community and the workplace community) is required to bring the desired change. Indeed, Steinert reports how "Theory is (...) noticeably absent from the faculty development literature"(Steinert, 2012); however, "a number of general educational theories can be applied to faculty development and the development of faculty members, including constructivism, social learning, self-efficacy (...) and immersive learning." As we will see in the following chapters, there are many gaps and opportunities to be explored in terms of faculty and organizational capacity development in terms of theory, practice and (re)-organizing.

2.2. Networked learning and communities of practice in higher education - some thoughts on faculty development

Networked learning is a unity of three main elements: people, computers, and their mutual connections (Jandrić and Boras, 2015). An early definition of networked learning describes *"learning in which information and communication technology (ICT) is used to promote connections: between one learner and other learners; between learners and tutors; between a learning community and its learning resources"* (Goodyear et al., 2004). However, it is worth noting, that "Networked Learning" as a notion reflects a paradigm, a worldview if you will, and philosophy, with political elements such as social justice and emancipation (Gourlay et al., 2021), which is highly connected to democratization, openness and horizontal relationships, as stated in the following definition of networked learning: "*Networked learning involves processes of collaborative, co-operative and collective inquiry, knowledge-creation and knowledgeable action, underpinned by trusting relationships, motivated by a sense of shared challenge and enabled by convivial technologies".* (Networked Learning Editorial Collective (NLEC) 2021).

Networked Learning can also extend to "community of practice" approaches and experiences aimed at faculty development. One such example is an initiative at Michigan University between 2016 and 2018, the Interprofessional Leadership Fellows Program (IPL), which utilizes the Community of Practice framework. It has encouraged some faculties to work together in a structured manner to address critical Interprofessional Education (IPE). According to the authors, it has been successful thanks to *"a longitudinal, structured, theory-based process; a selection procedure designed to choose a diverse set of dedicated faculty; and an institutional pathway intended to encourage participant involvement in the IPE movement after program completion"* (Ascione et al., 2022). However, it is worth noting, that this approach does not specifically cover faculty development in terms of digital educational transformation.

Geographical distribution of networked learning approaches are little disproportional; although there seems to be a greater epistemic awareness and study of the phenomenon in the Anglo-American area (Hodgson & McConnell, 2020), in practice, networked learning has been diffused further from what some might regard as a more developed technological society, and in places, where covid era caught more

unprepared, the need for networked learning has been more felt. In fact, as opposed to our expectations, the experiences of networked learning take place technologically developed countries. Another case is the Bill and Melinda Gates Foundation, which has among its philanthropic purposes precisely that of *"encouraging an emerging community of practice related to online teaching and learning"* (Eldridge et al., 2021). We can say that this purpose has acquired an even stronger meaning with the outbreak of the pandemic. In the technologically highly developed world, such as Denmark and Sweden have more prominent networked learning approaches (Håkansson Lindqvist et al., 2020; Jaldemark & Öhman, 2020). There are, instead, numerous experiences in areas where the effect of Covid has caught the population more unprepared for a greater lack of technological infrastructures, information technology culture and tradition related to remote teaching: cases of Central and South America, where they have relied on simple but very popular tools like social media to create networked learning strategies (Romero-Hall, 2021) and thus, break down borders and difficulties. An interesting case is that of Chile where an Initial Teacher Education (ITE) was tested through collaboration in a university-school partnership(Madrid Miranda & Chapman, 2021). Networked learning experiences are leveraged also in Africa: Zambia and Zimbabwe (Gaved et al., 2020) and as well as Singapore (Chinengundu et al., 2022).

In short, the global scenario, at least for now, is that of an unequal landscape (Swinnerton et al., 2020), with great disparities but also with great development possibilities for networked learning. A trend is to involve in partnership with both more developed and less developed countries in this area (Creelman et al., 2021). This trend partially and more weakly had begun even before the Covid era. Moreover, between the significant questions and perspectives for future research and practice, there are other issues such as *"social justice, criticality, mobility, new forms of openness and learning in the public arena"*(Dohn et al., 2018). Despite this large international scientific engagement, an overall study is missing with the aim of offering an overview and identifying the most effective practices, among the many so far implemented by the individual centres of higher education. The question is overall pedagogical, geographical, or sociological.

2.3. Transformative educational technologies and the pandemic: the meso space

As some authors have claimed, transformative educational technology can be theorised as a *meso-related venture* (Bardone & Eradze, 2022; Eradze et al., 2021). Theorised based on the work of Secchi and Cowley(Secchi & Cowley, 2021), which distinguishes micro-meso-macro levels of organisational cognition, this framework takes the pandemic-related educational emergency as the magnifying glass for understanding the transformational potential of educational technologies and their adoption, thus representing unprecedented theorising opportunities. To further explain the framework we summarize it in the table below (Bardone & Eradze, 2022; Eradze et al., 2021).

Table 1. The three organizational layers (from (Bardone & Eradze, 2022))

Level	Main characteristic	Variety	Uncertainty	Technology
Macro	Anticipatory of outcomes	Variety is organized already in certain forms	Certainty created by formalized forms of collaboration	Tools are instruments to maintain and enforce existing organized forms of organization
Meso	Responsive to particular situations in the here and now	Variety is dealt with within the organized forms	Handling of contingency	Tools help face contingency in everyday situations
	Generative of new alternative organized forms of organization	Variety is being re-organized	Confronting insecurities and uncovering opportunities	Transformative character

Micro	Generative variety	Variety is unorganized	Source of variety and therefore of uncertainty	Emphasis placed upon how the single individuals approach technology

This *meso level* can be also identified as a community level and collaborative space where uncertainties and opportunities emerge by contextualising educational technology tools in learning practice. Even though this space is not necessarily collaborative, but a conceptual and transformational space, where re-organizing with tools takes place. With this conceptualisation, authors suggest that habitual approaches where the transformational potential is an individual responsibility, attitudes, or perceptions (micro-level) or is governed by already existing frames of operation (macro-level) are the reason transformational potential is reduced to a technical instrumentality or so-called instrumentalist approaches. Coupled with conceptualisation of networked learning, this framework can be usefully applied to general digital transformational efforts organizations make.

3. Networked Learning - Brief bibliometric analysis

3.1. Data collection

To identify some of the recurrent topics in the faculty development focused on digital education, we have undertaken a bibliometric study. We have constructed a query with an iterative approach by running several test queries the scientific database Scopus. The final query was constructed as such: TITLE-ABS-KEY (("Faculty development" OR "professional development") AND (university* OR "higher education") AND ("digital education" OR eLearning OR "networked learning" OR "distance education" OR "technology-enhanced learning" OR "learning technolog*" OR "Education* technologi*")) . The query returned 730 documents. The query was run on 16th of December, 2021.

3.2. Data analysis

First, we have analysed *the keywords* in the publications: minimum number of keyword occurrences were 5. We can observe several clusters, where faculty development and online learning, as well as distance education, are in different clusters, however, they are central in the network. We can also observe that the connection to the notions of the "communities of practice" and "networked learning" is slightly peripheral. While COVID-19 has a relatively prominent place in the network.
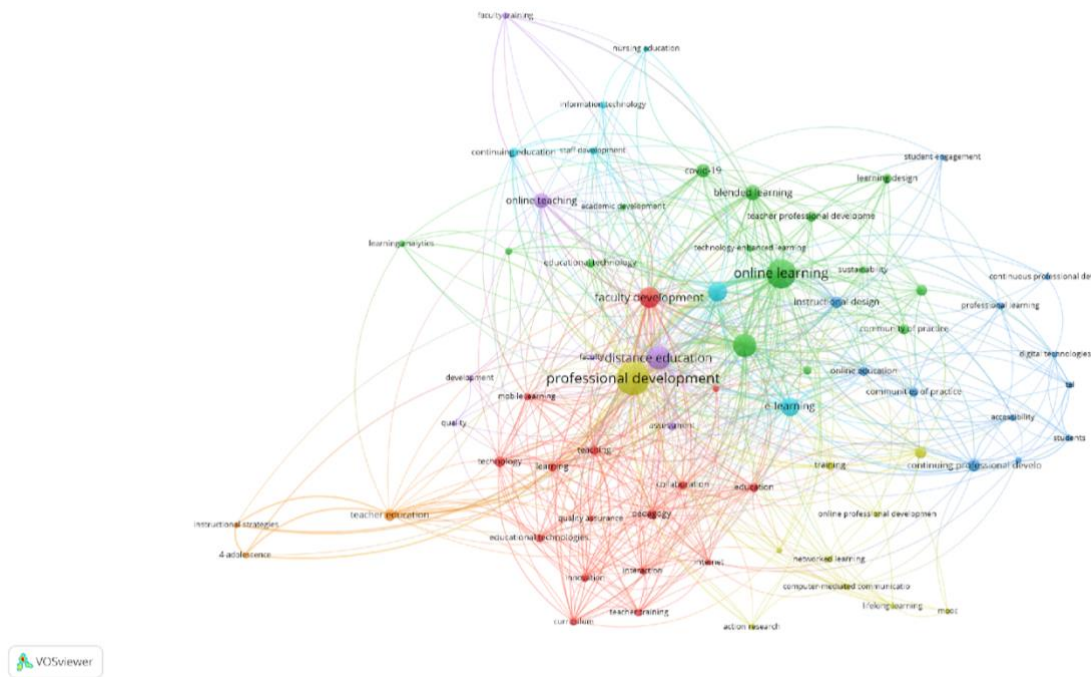
Figure 1. Overall network based on keywords: Link to the dynamic map

Next, we analysed the abstracts/title with text mining. Occurrences of the term were defined for 15 and out of 14155 terms, 342 met the threshold. For each of the 342 terms, relevance scores were calculated. The number of terms selected was 205. Irrelevant terms related to location (Canada, the US), research terms such as proceedings, research, data etc. were excluded from the analysis.
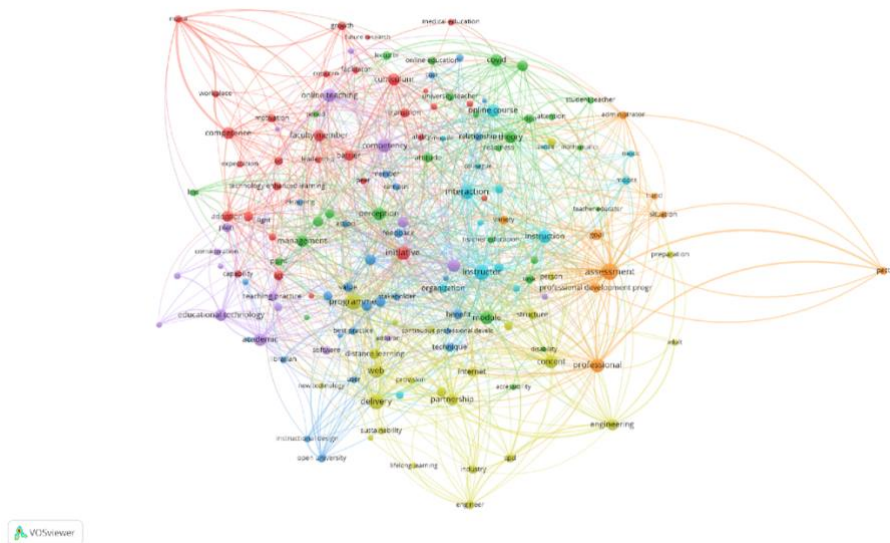
Figure 2. Network analysis based on text mining of title and abstract, link to dynamic network.

Results show that the network has 7 clusters, where we cannot observe specific frameworks for faculty development for digital education, however, in one cluster (orange) we can see a connection to a non-specific (to digital education) framework for faculty development (PACT) in a very peripheral manner. This cluster is an interesting case, where the "assessment," "professional development "and "goal" have a pronounced centrality. It is also connected to a more peripheral "administrator" and more centralized "variety," whereas the peripheral word "situation" is related to the pandemic. Another more or less central cluster (light blue) that can be noticed is the cluster around "instruction," "interaction" and "online courses" which have peripherally related topics such as "moocs." Another cluster (green) is also an interesting one, which is

concentrated mostly peripherally and include highly prominent and relevant keywords such as "COVID" and "theory," but also "readiness," "attitude," "perceptions," etc. However, we can see that it extends further in the network and is related to the issues such as "management" "accessibility" and "lms" (Figure 3). This can give us some ground to think, that COVID and the pandemic have created more need for theories, raise more issues such as management, but also, we can still notice that much research has been concentrated on "perceptions" and "attitudes." Moreover, we can see that these two keywords take the central position. This means that most of the research is still concentrated on micro and individual-level issues (see Table 1).
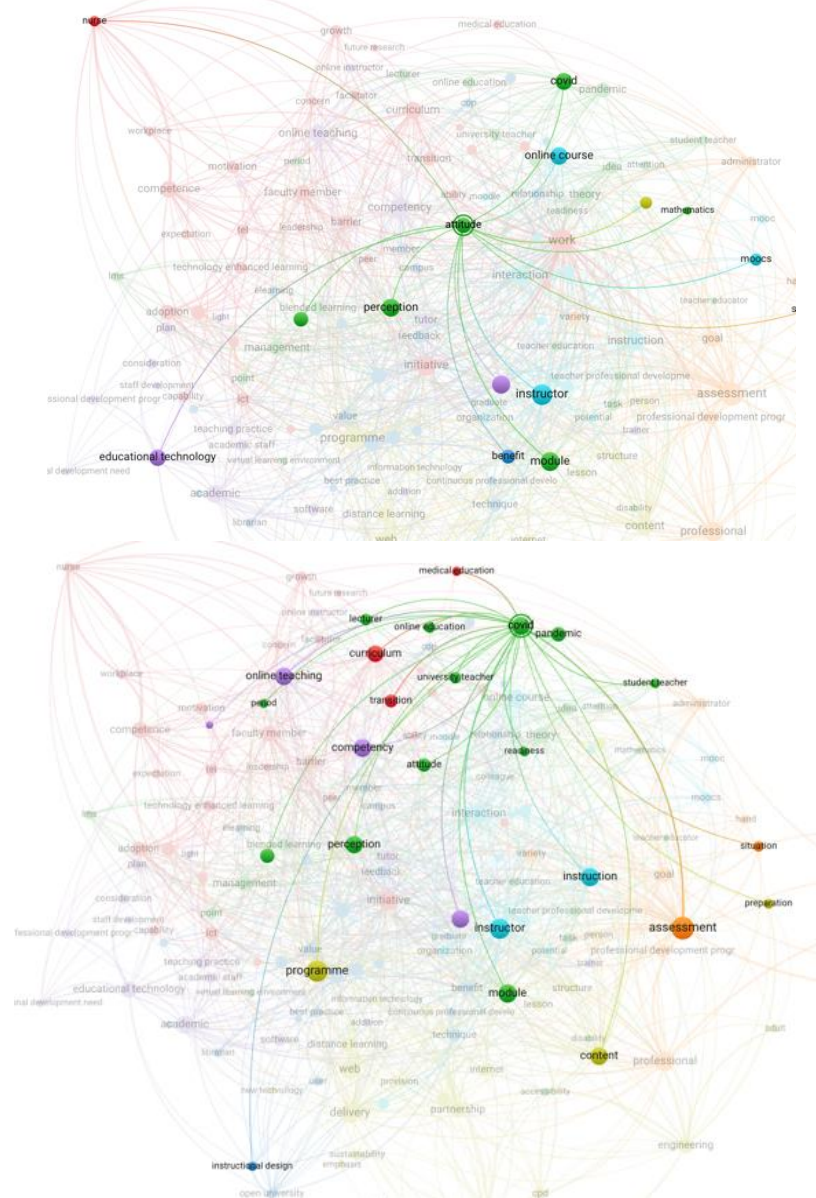
Figure 3. Specific key words analysed

Then we can observe the dark blue cluster with "innovation" (see Figure 4) in the centre, however, still, the peripheral position is taken by another framework for professional development "cop" that we see at the edge. We can also observe that innovation is also connected with other clusters and keywords such as "competence," "adoption," "growth" and "curriculum" and "assessment."
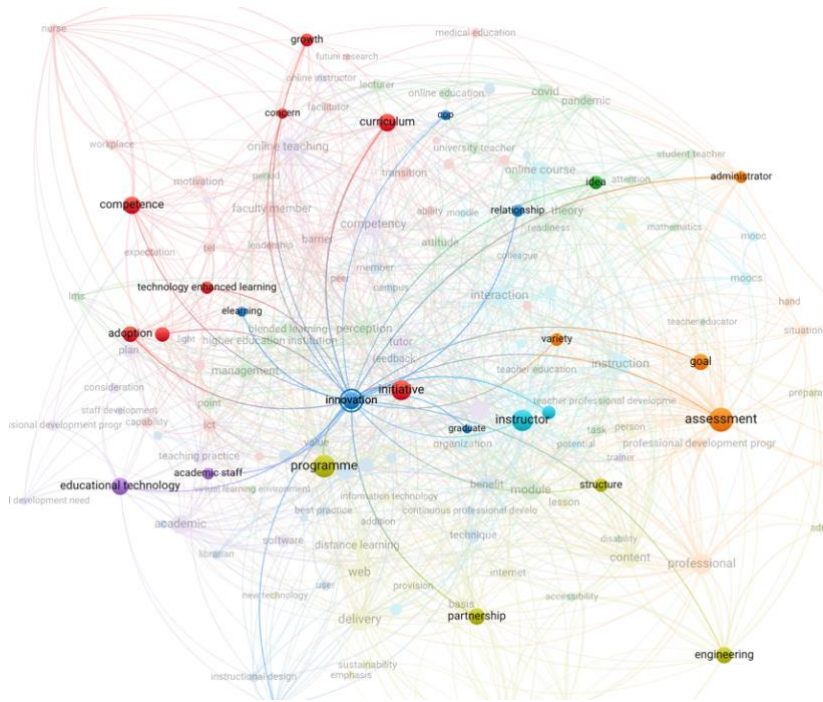
Then we have a red cluster, at the left edge of the network, with "curriculum" and "initiative" with the most total link strengths. Here, "Adoption" and "competence," however, peripherally, still have their prominence.
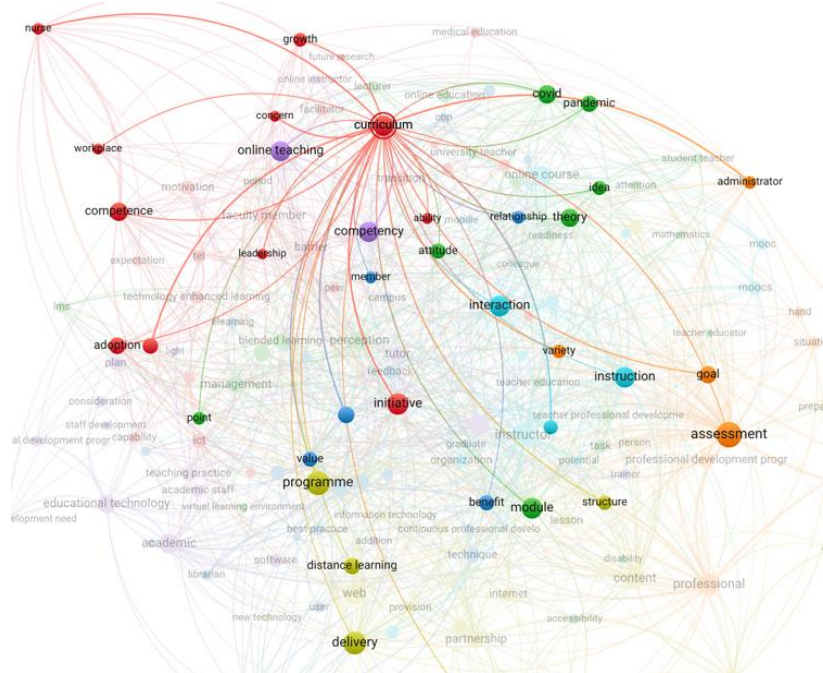
Figure 5. Associated keywords around "curriculum"

Another cluster (violet) demonstrates a peripheral position as well, however, here we find the most central and most prominent keyword "platform" that belongs to this cluster (figure 6). Other keywords are "educational technology," "teaching practice," "academic ", "professional development," "software" etc. We can say that also this cluster with its central concept of "platform" is related to covid, pandemic, attitude, and adoption issues.

Figure 6. Keyword "platform" and its associations

We should underline that bibliographic research only has an illustrative power and cannot be taken as evidence. As a general note, overall, this research has demonstrated, that COVID and the pandemic have created more need for theories, raise more issues such as management and organization. Another main conclusion from bibliographic research is that it is still concentrated on individual-level issues such as "perceptions" and "attitudes" as we can see that these two keywords take the central position. As far as the Framework is concerned, we cannot observe Frameworks specifically for digital education, however, a connection to a non-specific (to digital education) framework for faculty development (PACT) has been noted. We have also seen CoP (communities of practice). Both frameworks have a peripheral position in the network.

4. Concluding proposal: Faculty Development Model for HEIs Digital Educational Transformation

Given the COVID-19 related increase in technology use, based on the lessons learned during the pandemic, respective qualitative research in line with a European project BRIDGES objectives, and bibliometric analysis above we present a model for faculty development. Bibliometric analysis demonstrated the need for networked learning and community approaches in faculty development as well as the lack of theoretical tools: models and frameworks to promote digital educational innovation and faculty development. The model is also based on theoretical concepts outlined above and qualitative research, based on 5 country data (Italy, Slovenia, Spain, Turkey, UK), involving 5 academics per university with different academic profiles and disciplines. Detailed research results have been published (León-Urrutia et al., 2022).

To summarize the findings, from the perspective of using networked learning, the interviews suggest most academics are not familiar with the formal concept of "networked learning" per se, or more concretely, they think they do not implement it but they often actually do in practice in limited ways (within depts, with colleagues mainly). However, our data suggest that the potential of leveraging and making beneficial use of networked learning is remarkably high - especially as academics are most interested in materials and techniques related to their own discipline.

Our qualitative interview findings suggest what has been already discussed in the literature and in the previous chapters (chapter 2.1): academics have limited time and mental resources to focus on abstract educational theory when thinking about their direct teaching commitments and needs. Some have a general

interest in the theory, but many, or even most do not have such specific interests. Academics are specifically interested in their direct work, their subject, their methods, and seeing real cases and contextualizing tools in practice.

For this reason, we should enforce the ways to generate and focus on practical challenges that academics face in their teaching practices. On the other hand, it should also focus on examples of good practice. The second phase could then combine or sequence the tools and pedagogy elements. The idea could be to use a 'just in time' model of delivering theoretical and pedagogical knowledge. Bringing in the theory only when needed, and only as much as needed. The contextualization part is what motivates and catches the attention of academics, so it should be best used as a motivator to get them engaged in the process of developing their online teaching, what they call *sense of shared* challenges (Networked Learning Editorial Collective (NLEC), 2021) or what some have called *uncertainties* (Bardone et al., 2022). From there, the important ed theory can be 'smuggled' in or integrated as they develop their teaching practice. This means the first step will need some way to generate or surface context-relevant things to discuss and develop upon, but this would get easier as the communities develop (more resources become available, examples of good practice in particular disciplines etc).
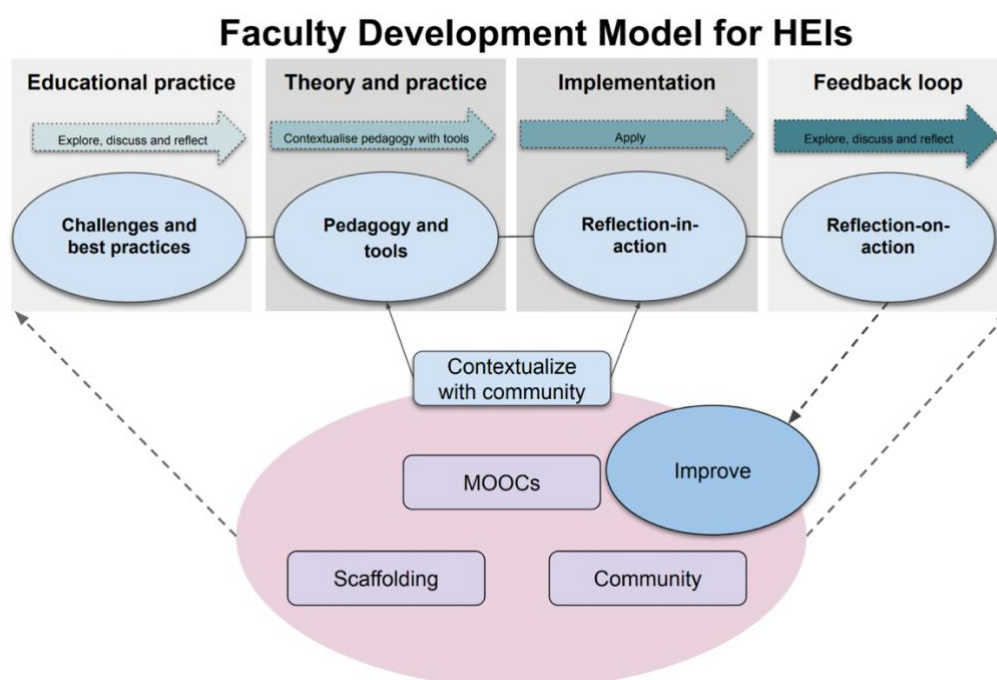
Figure 7. Faculty Development Model for Higher Educational Digital Educational Transformation

Based on this data, to describe the proposed model we will present the following steps: the professional development activities start with sharing knowledge on challenges and good practices within the context of digital education (educational practice). The second step is a combined, contextualised portion of pedagogical and theoretical knowledge and tools. In this model pedagogy and tools are considered in tandem, entangled, where pedagogy does not drive tools or tools do not drive pedagogy (Fawns, 2022). This step also includes training on cognitive neurosciences and relevant, evidence-based knowledge on the functioning of the brain (theory and practice). The acquired knowledge is further contextualized in the field of technology-enhanced learning with the application of tools (tools) in actual practice and two-step reflection process reflection-in-action and reflection-on-action (Schön, 1983). We posit that innovative pedagogies can be developed between the first 3 steps, also while implemented in the educational practice (implementation), and further improved by reflection (feedback loop) with the help of the community, at the so called *meso level* of organizing cognition. All the steps listed below are contextualised in the networked learning approach with the help of the community of practice, which is supported by forums or other collaborative tools and/or MOOCs. MOOCs

can then become the connecting bits for theoretical knowledge. The approach will make it possible to go beyond individual/micro level issues that has been demonstrated by the bibliometric analysis (chapter 3) and develop organizational capacity towards digital educational transformation. This practical model is based not only on research results and bibliometric analysis presented in this article; it also uses the theoretical framework also supported by previous research as discussed in chapter 2.3. (Bardone & Eradze, 2022; Eradze et al., 2021).

5. Acknowledgements

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From videoconferences to webinars. Innovative uses and applications

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Abstract

In the two last decades, synchronous means have changed drastically. The means were simpler. The synchronous communication was carried out by face-to-face meetings, phone, chat, and videoconference. The videoconferences were very expensive and required the people presence in rooms to connect from one to another one. The connection was supported on special phone cable connections and the in-room presence of people was required. It was called 'multipoint' communication because people had to be in videoconference rooms with specific means as TV, camera, micros, loudspeakers, and technical means to connect to the other room. Nowadays, all videoconferences are carried out through virtual means. During these 20 years, we have passed from videoconferences to webinars. The pandemic context has transformed face-to-face teaching program to classes transmitted by the Internet and has diffused an inexact meaning of videoconference. By the way, students have normalized the videocommunication as usual means and ask for it commonly. This new situation requires analysing the state of the art and reflecting on this transformation, from technical and pedagogical point of view, collecting uses, applications, lessons learned, and recommendations.

Keywords: videoconference; technology;

1. Introduction

Distance education has gone through various stages in which the essential role of the technologies with which it is developed stands out. This technology has often been combined in a wide variety of ways with face-to-face meetings or activities for various purposes such as administrative tasks, acquisition of resources, access to materials, carrying out activities, guidance, tutoring or assessment, for example. The most up-to-date technological means allow us to provide possibilities of mediated communication, both synchronous and asynchronous, without resorting to face-to-face learning, thus defining new modalities, methodologies, or differentiated and characteristic opportunities (Taylor, 2001). Later generations of distance education were characterized by technologies that provided opportunities for interaction with content, in the form of audiotapes and

videotapes, and later, learning management systems. Subsequently, possibilities for person-to-person interaction increased (Caladine et al., 2010, p. 250).

The technology improvement caused a renewed interest in using IP for videoconferencing. Videoconferencing is one of those possibilities that has been transformed significantly with the advent of the Internet which has made it easier, cheaper and more popular. Higher education has been the biggest user of video communications worldwide and is continuing increasing with the new software solutions (Greenberg, 2008). Contrary to what one might think from observing how it works, videoconferencing is not a format derived from the application of live television but from telephone calls (Caladine, 2008). The telephone is the synchronous medium par excellence and has been extended by incorporating images in the 1980s. This drift is reflected, for example, in the terminology used, such as the word "call" rather than "connection". In fact, the initial connections were made by highly improved and expensive telephone lines that provided the necessary support for the establishment of communication.

Unlike other channels also widely used in non-classroom training such as radio or television, videoconferencing allows for much more efficient live communication and combines a layout very close to the face-to-face format that radio or television also offer, but with an immediacy very similar to telephone or chat. It also establishes the possibility of communicative equality between users thanks to the possibility of horizontal interaction between equals, which enables the democratisation of the media in a context of universal access that is difficult to provide with more sophisticated media such as radio or television.

1.1. Definition and characteristics

Several terms have been used to describe synchronous audiovisual communication, which could be the definition of the technology we are focusing on in this paper: videoconference, videoconferencing, videocast, videocall, IP conference, virtual meeting, telecommunication, telecommuting, telecomputing, teleconference, teleconferencing, teleconnection, telematic class, webconference, or webinar. With their nuances and differences, these denominations refer to a communicative act carried out live by audiovisual means, whose characteristics could be defined as follows:

- Communication: interaction among several bodies.
- Bidirectionality: all participants can send and receive messages.
- Synchrony: real-time exchange of communicative actions.
- Distance: presence of the interlocutors in different places.
- Technology: mediated exchange of communication.
- Audiovisual: combination of the two channels simultaneously, sound and visual.

Videoconferencing also supports complementary components that bring new possibilities in its development:

- Control of the identity of participants.
- Use of both visual and audio display media.
- Displacement during connection.
- Recording of the event.
- Subtitled.

- Incorporation of any activity from the device itself (work tools, documents, etc.).
- Use of other complementary media (gamification resources, social networks, telephone, etc.).

The purpose of a videoconference can be very varied and responds to the diversity of any other activity that can be carried out face-to-face. Videoconferencing has often been used for teaching classes, tutorials, meetings, tests, examinations, interviews and research techniques. In any case, it can be said that videoconferencing is a common tool in all sectors of society, whether public or private, institutional or private, corporate or non-governmental, collective or individual. Current technologies have enabled its universalisation and augur a promising future, probably with new modalities still unknown to the general public, which will establish it as a leading tool in past, present and future distance education.

1.2. Drivers for the Uptake of Audiovisual Communications

Caladine et al. (2010) have analysed the factors that have driven the development of audiovisual technology in communication:

- The costs of the initial technologies were very expensive, but the introduction of IP has made videoconferencing much cheaper and more popular. This has been accompanied by the development of popular tools and devices that enable the development of this technology.
- Climate change that is visible to the naked eye and is assumed as a requirement in new business and institutional management and organisation policies. There is a widespread awareness that travel should be avoided when it can be replaced by other types of meetings.
- The audiovisual world has become widespread as a form of access to information, work, leisure and knowledge. The image has become as valuable a standard as the written word, and even superior depending on the procedures and the goals.

2. Guidelines for the development of videoconferences

For the development of videoconferences, we can identify requirements and recommendations for three types of guidelines: technological, technical and methodological.

2.1. Technological guidelines

Technological patterns refer to the use of media:

- Planning and designing the session: Planning requires short at least on the target audience, the objectives, the context, the means available and the time frame. It is not so much a matter of making a formal written design as of having identified these elements by reflecting them, for example, in the presentation to be used.
- Give procedural guidelines (access, use, participation, presentation, etc.): It is necessary to still give indications to participants on how and when to access, what to prepare beforehand and how to participate. Written guidelines, tutorials or examples of other actions should be provided.

- Convene in good time: This should be done in a call with sufficient time and, if they are to be held on a regular basis, establish a calendar with predetermined dates, if possible, keeping the day and time of the week in all of them.
- Collect previous expectations and knowledge: It is interesting to carry out a small survey beforehand to find out about previous knowledge and experience of both the content of the session and the use of the tools.
- Inform in advance about the content of the session and the work plan: It is important to inform about the content and structure of the session, as well as the methodology to be followed.
- Pre- and in-session technical checks: It is necessary to have pre-checked and re-checked the media during the session to avoid system failures, e.g. when sharing the screen or recording.
- Recording the event: We must give the possibility to watch the session again or to access it if it has not been possible to participate live. It is interesting to allude to the audience that will watch the recorded session during the same recording.
- Live subtitling: The current regulatory framework of the European Union obliges us to offer minimum accessibility requirements. One of them, on the other hand, very effective and very simple to apply, is live subtitling. All the technologies we have tested in Spanish, Portuguese and English have proven to be highly effective despite the small errors that may occur (Teams, PowerPoint, Zoom).
- Maintain the personal image simultaneously with the expository resources: To break the monotony, it is interesting to alternate the different shots, as well as to combine the resources on screen such as the presentation and the view of the person speaking.
- Use complementary means such as chat: In order to facilitate access for people who may have communication disabilities or technological difficulties, it is interesting to maintain parallel communication with the live chat during the session.
- Provide the recording afterwards with closed captioning and active index: It should also include closed captioning or a transcript, as well as an active index that allows users to view those parts of interest to them.
- Report on the availability of and access to the recording: The recording provided should be adequately located and publicised.
- Review and edit the recording if necessary (post-production): Uploading recordings that have not been reviewed should be avoided so that, as far as possible, the final product is understandable and up to the standard of an institutional product.
- Include credits and identify the people involved in the recording: You need to include information about the people who contributed to the production as well as those who appear throughout the session.
- Use support resources (presentation, images, videos, audios, realia, tools, etc.): The use of complementary resources makes it possible to dynamise and diversify participation from multiple perspectives, but it is necessary not to improvise by rehearsing their compatibility with the development of the session and the recording beforehand.

- Checking the sound: Checking the sound, its intensity, clarity and comprehension will ensure a good understanding of the session both live and in the recording.
- Collect ex-post evaluation: Collecting feedback will be very useful to check the impact of our methodology and the means used, as well as the learning achieved.

2.2. Technical guidelines

The technical guidelines refer to the optimisation of the audiovisual quality of the videoconference:

- Maintain a frontal shot that ensures communicative equality and horizontal perception equivalent to the situation of people seated around a table. Avoid dive shots or close-up shots of the people. These shots, as well as the zenith and nadir, can be very appropriate for explanations, shots of objects, or demonstrations, but not for people.
- Provide sufficient, natural, frontal lighting to avoid shadows on facial features or objects. Avoid backlit images that make it difficult to see participants or objects and compensate for the absence of light with artificial lighting if necessary.
- Choose the size of the image of the participants and calculate the distance at which they should be positioned accordingly: Full body frame (General Plan); The person occupies the whole frame (Figure Plan); From the head to the top of the knees (American or 3/4 Plan); From the waist to the head (Medium Plan); From the chest to the head (Medium Short Plan).
- Fill the frame by centring the image according to the chosen shot unless the gaze is not directed at the camera (more space should be left on the side you are looking at) or you complete the shot with an object or a significant element of the set such as the logo of the institution or an image of interest.
- Balance the image against the lines of the scene. When the background reflects strong lines such as shelves, furniture or pictures, the shot should be balanced to avoid creating a sense of tilt or imbalance. This effect is seen in horizontal and vertical lines as well as diagonals.
- Maintain a dynamic facial and oral expressiveness that engages the interlocutors during your interventions. The eyes play an essential role in this, and the tone of voice contributes greatly to breaking the monotony and communicating an expression and active listening that enhances the phatic function of communication.
- Use oblique or moving directions for demonstrations or explanations of objects. Fixed frontal shots sometimes make it difficult to understand and interpret shots of objects. In these cases, changing direction and the play of shadows can help to understand the depth features and irregularities of the objects.
- The grid of the rule of thirds always helps us to compose the arrangement of the shots, e.g. to position the head, the bust or the members of a round table (headroom, leadroom, golden ratio, etc.). It is always advisable to bring the speakers to the foreground and to avoid their figure being absorbed in a general shot that is too wide.
- Use high figure-ground contrasts (figure-ground organisation). Colour codes, some fonts (with serif) or low contrast with the background create difficulties for some visual or cognitive disabilities.
- Avoid large amounts of information on screen, e.g. in presentations. Slides should be clear, synthetic and structured. Too much data or text distracts the audience and creates

contradictions as it is not clear what to pay attention to, the person speaking, or the information presented in writing.

- It is recommended to avoid single fixed shots by making a balanced alternation of shots and images. Long fixed shots create monotony that can be broken by dynamic speech, movement of people (e.g., in a wide shot) or the introduction of complementary resources such as objects, presentations or other tools.

- You should keep your eyes on the camera. This conveys the feeling that you are speaking directly to your interlocutors. This effect can be observed not only in television and videoconferencing, but also in art, especially in painting and photography, throughout history as in the case of famous paintings such as La Gioconda (Leonardo da Vinci, approximately 1519). It is more difficult in front of a computer screen because we look at the people on the screen. On laptops that often have a camera integrated in the upper area of the screen, this creates the perception of looking at the floor. We should look directly at the camera, even if we look at the screen alternately, in order to observe the non-verbal reactions of our interlocutors.

- Contextualise the event in a setting appropriate to the training situation being developed with appropriate physical environments or backdrops. Avoid highly distracting or inappropriate environments.

2.3. Methodological guidelines

The methodological guidelines identify the didactic possibilities that can be used in this type of event:

- Choose the methodological style that best suits the purpose of the session (expository, questioning, participatory, active, playful, etc.). There is no universal methodology. Each type of session requires its own approach which must be designed and experimented with.

- Structure the session in phases that do not exceed 25 minutes. This is the pomodoro methodology (Cirillo, 2018): sessions of 25 minutes maximum and a 5-minute break. Shorter periods also make it possible to structure and dynamise the sessions.

- Explain the table of contents at the beginning and successive subscripts throughout the session. Progress and organisational reminders are typical of oral discourse and help to locate participants throughout the session, especially if they are at home and we do not control the distractions to which they may be subjected.

- Provide materials in advance. Materials, access or content to be used during the session can be provided so that participants can browse through them or simply have them available when they are to be used.

- Request preparatory activities (readings, visualisations, data collection, completion of tasks, etc.). This is a very interesting possibility as it allows to take certain contents for granted or to use information or data provided by the participants themselves.

- Conduct a reminder of previous sessions at the beginning of the session to be developed. The possibility of recalling the main ideas of the previous session is a way of linking the new knowledge with the previously obtained knowledge.

- Carrying out anaphora throughout the session (anticipations, repetitions and summaries). The possibility of relating content within the session itself helps to establish relationships and interweave new learning with each other.
- Combine strategies throughout the session (questioning, use of prior knowledge, participation, exposure, intuition, and silence). Apart from the gamification strategies that can be used, a session with varied methodologies is more dynamic.
- Combine inductive and deductive dynamics. The use of examples both as a starting point and in application always helps the understanding of the explanations and is illustrative and facilitating.
- Offer open spaces and alternatives in the contents afterwards. It is interesting to leave the contents open throughout the session and provide the possibility for participants to complete the topics with ideas, experiences and suggestions. It is fun and participatory.
- Highlight essential learning throughout the session. It is necessary to highlight the main ideas throughout the session. If reinforced with mnemonic techniques, it will help to fix the content to be remembered.
- Introduce dynamic strategies such as group dynamics, gamification or humour.
- Summarise at the end of the session. It will help to provide a cohesive overview. It will provide a neat summary as a reminder.
- Provide activities to apply the learning from the session. Rather than making the session too long, it is better to provide extension and application activities afterwards.
- Provide with the recording any documents, links or complementary information to expand or complement the session.

3. The future of videoconferencing

Undoubtedly, the development of the metaverse will transform the current conception of videoconferencing. The immersive possibilities of this new technology will open up new forms of development very close to face-to-face experiences. Darby et al. (2022) predict a generalisation of university training practices based on the metaverse. However, some authors warn of the factors affecting the readiness of universities to organise learning activities in the metaverse era (Puncreobutr et al., 2022). Simply changing the technology does not ensure methodological change or improved learning, so further research and strengthening the pedagogical transformation of the university will be necessary.

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Higher education beyond Covid-19: What do teachers need when moving to online education

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Abstract

The Covid-19 pandemic caused major upheaval of education across all levels. Schools, colleges, and higher education institutes closed and had to move to online delivery of content and teaching almost overnight. In the context of the Erasmus+ DigiTel Pro project we performed a rapid literature review to discover how the Covid-19 pandemic impacted higher education with a focus on teachers and students and what teachers' needs are post-Covid when higher education moves to online education.

It is obvious that the overnight switch imposed some challenges and problems. Immediate response was to make learning material available online and look for solutions to provide online lectures. Although students appreciated the effort in the attempts to continue education, after time some objections arose both by teaching staff and by students as quality was not as used to be. Moving to online education entails more than quickly providing content online and making use of commercial conferencing software. This was dubbed as 'remote emergency teaching' as an indication that the quality of this education is not as it should be. Some of the negative feelings and perceptions might be due to being inexperienced with digital and online education, pedagogies and didactics and lack of suitable learning environments and supporting technology and infrastructure.

Many teachers felt overpowered by the abrupt change and experienced an increase in workload and change in their role as teacher having to provide mental and psychological support to students due to the crisis situation. Teachers did not have the proper technical resources, tools and internet access. More importantly, teachers reported not being equipped for online teaching and felt that they lack the skills and competences to develop new learning material suitable for online delivery. While there was not sufficient time to adjust instructional design and pedagogy, teachers tried to find alternatives for the interaction with students. Similarly, students wellbeing was affected. Students also report lack of facilities at home, such as a proper place to study, access to a computer for schoolwork and sufficient internet access. While solutions were found for online delivery of learning material and lectures, several other processes were discontinued. Many institutions had difficulty in taking exams and providing assessment; some institutions even completely stopped the exams, other institutions resorted to some form of online assessment.

Not all was perceived as negative though, because the pandemic illustrated the need and provided opportunities to move forward. We already know a lot about various forms of online delivery of education, be that in hybrid, blended or fully online and distance education. The various EU and national policies on digital

society and digital education support the further need of digitalisation of higher education. The literature indicated directions to take to support teachers: continued teacher professionalisation for digital education; educational models for online education; and more support for diversity, inclusion and accessibility. We provide some suggestions what these directions entails.

Keywords: covid19, digitalisation of education, teacher professionalisation.

1. Introduction

The Covid-19 pandemic caused a major disruption to the educational system. Many schools, vocational and higher education institutions were forced to close their buildings and had to switch immediately to online provision of education. For most educational institutions this caused a major disruption of all educational processes. During the lockdowns periods, educational institutions had no choice other than to go fully online. However, it is not likely that campus-based higher education institutions will convert and transform their education to be fully online. It is much more likely that they will continue face-to-face education and combine that with various forms of online delivery of course components and synchronous and asynchronous online teaching and tutoring processes. Even those changes will require that teaching and support staff as well as students need to be prepared for online, blended, and hybrid education.

In the context of the Erasmus+ DigiTelPro project, we performed a rapid literature review on teachers' needs when moving to fully or partly online education. The focus of this literature review lies with teachers in higher education. Because students' experiences and needs are also influenced by online education, we also report on students' experiences during the Covid-19 pandemic.

Digital education

Many of the reviewed publications use the term online education without being specific about its meaning, other than that some form of online delivery is involved. *Digital education* might be a more fitting term for education based on educational technology (e.g., (Siemens et al., 2015; The Quality Assurance Agency for Higher Education, 2020)). Digital education includes several forms of education where at least part of the education and learning takes place online, meaning through the use of the Internet, such as:

- synchronous hybrid learning: based on settings that have in common that both on-site or 'here' students and remote or 'there' students are simultaneously included;
- blended learning: based on a course design with a deliberate combination of online and offline learning activities;
- online and distance learning: based on a course design with a continuous physical separation between teacher and learner, synchronously and asynchronously

All these forms have in common that at least part of the education, both teaching and learning, Is provided through an online mode. The particulars of an online delivery mode require that courses are redesigned and students supported with learning designs and pedagogical models that support and promote online teaching and learning. This aspect is where the focus of teacher professionalisation will have to be.

2. Methodology

We performed a rapid literature review on a variety of resources, such as national surveys, (peer-reviewed) journal articles, reports and documents that were collected in several phases. In September 2021, we started with a list of publications already gathered for the DigiTelPro project. It further included literature found by (a) keyword searches in Google Scholar and renowned databases like EBSCO's ERIC and PsycINFO and Clarivate's

Emerging Sources Citation Index and Social Science Citation Index using terms 'covid*' OR 'pandemic' AND 'higher education', (b) backward and forward searches in/via databases and sources (i.e., 'snowballing'), and (c) targeted notifications of journal updates. Next, project partners added resources to this list they deemed relevant. This resulted in a list of 193 sources. From October 2021- March 2022 we selected relevant sources and gathered information about type of publication, peer review, methodology, participants, discipline and country and topic addressed. While writing the review, we looked for resources reporting on later phases of the Covid-19 pandemic.

The review included 60 resources. The selection consisted of 30 journal articles and 19 reports. It was not always possible to determine if publications had been peer-reviewed, 36 publications were peer-reviewed. About half of the publications reported on results obtained through surveys; others employed reviews, mixed-methods or empirical studies. Participants were students (11), teachers (10), students and staff (7), staff (varying from academics, teachers to supporting staff and management) (11).

3. Results

The first impression seems to be one of major upheaval, negative impact and experiences. The lockdowns required an almost overnight switch to online education that left little to no room for pedagogical adjustments. Some have dubbed this as *remote emergency teaching*: rapidly providing content online, but lacking in teaching presence and accommodating students' needs that transgressed those of immediate learning processes (Bozkurt & Sharma, 2020; Hodges et al., 2020). Institutions, staff, teachers and students faced many challenges following the disruptive nature of the Covid-19 pandemic. However, some report about the opportunities for higher education to move forward towards digitalisation of higher education.

We will present some of the findings, experiences and perspectives in the following paragraphs.

3.1 Teachers' perspectives

Many teachers are trained in and/or have experience in classroom teaching and lack the expertise for online teaching. Nevertheless, they put in an enormous effort in looking for solutions to continue with their courses and find alternative approaches to what usually would take place in a classroom setting. In general, teachers managed to find ways to provide learning material online and substitute classroom teaching with online lectures or recorded lectures. They struggled more with suitable pedagogical scenarios and maintaining interaction with students. Despite their efforts, teachers who had use new tools experienced feelings of insecurity and did not feel competent enough, did not want to use new tools at all, or felt they did not get sufficient training and support in using new tools, experienced an increased workload (Cutri et al., 2020; Johnson, 2020; Johnson, 2021; Marinoni et al., 2020; Scherer et al., 2021)). Teachers' attitude towards technology and situational factors such as previous experience influenced their expectations and actions.

3.2 Students' perspectives

Although students did acknowledge the effort in bringing education online, they were less positive about the quality of the education (e.g., (Brink et al., 2021; Hofer et al., 2021; Oliveira et al., 2021; Phillips, 2021)). They experienced problems with motivation, engagement, concentration; they missed the physical interactions and felt lonely, suffered ill-health and emotional problems (Aristeidou & Cross, 2021; Beardsley et al., 2021; Brink et al., 2021; Dascalu et al., 2021; Jamalpur et al., 2021; Oliveira et al., 2021). Problems were aggravated by financial problems and other socio-economic factors. The Covid-19 pandemic highlighted and increased the differences caused by socio-economic factors and increased the digital divide.

Context and manner of implementation seemed to impact students' experiences and perspectives as shown by the conflicting results. Some studies report that students did not want to continue with online education, while other studies showed that students would like to keep at least part of the online delivery and pedagogies. Students seemed to like aspects of blended learning, empathic teachers, formative assessments (e.g., (Beardsley et al., 2021; Brink et al., 2021; Dascalu et al., 2021; Jamalpur et al., 2021; Meijer, 2021; Oliveira et al., 2021)).

The pandemic also invaded the privacy of the home situation. Families now life and work together 24/7, having to share spaces and roles, conducting activities at home they usually do elsewhere (e.g., job, hobby, or sport). Often, parents and children have to juggle for space, sharing space and devices, often not even having a suitable device like laptops for every individual and having to resort to the use of smartphones, or lack sufficient internet bandwidth (Di Gesú & González, 2020; Ferri et al., 2020; Hofer et al., 2021; Watermeyer et al., 2021).

4. Conclusions

The reviewed publications made clear that students and teachers struggled to maintain social aspects, interaction and communication. The pandemic highlighted the digital divide, further disadvantaged certain groups, and indicated several aspects that are usually taken for granted such as access to devices and infrastructure and a place to work and study.

Didactical perspective: While technology for online education was generally available at universities, many organisations did not adapt their instructional and pedagogical models accordingly to overcome shortcomings of technology while benefitting from its advantages. Given time constraints many universities simply tried to transfer their existing lectures into online lectures.

Social aspects: Consequently, students felt isolated and left alone. Social aspects of teacher-student interaction and student-student interaction fell short, leading to decreased motivation and increased risks of dropout and failure.

Learning situation at home: The home situation for students and staff differed significantly; some did not have separate rooms to have proper learning or teaching conditions. In addition, the technological equipment available to students and staff varied significantly, leading to disadvantages for students with lesser quality devices or poor internet connections.

To better prepare universities for similar situations in the future, we see the following main directions as important steps towards resilient higher education.

- Adaptation of educational models towards more online education.
- Teacher professionalization towards online education.
- Inclusion and support for disadvantaged learners.

Digital delivery is only one aspect of digital education. For digital education to become effective, efficient and enjoyable a learning space needs to evolve that supports the teaching processes and promotes the learning processes. The learner and the learning process is put central, and tht both staff and students have to change roles and adapt to this new form of teaching and learning. Teachers have to get used to new pedagogical and didactical approaches and use digital resources to the best possible outcomes. Students having to develop skills and competences to study in online, blended or hybrid settings (Bygstad et al., 2022; Goodyear, 2021; OECD, 2020; Vincent-Lancrin, 2022).

Online education includes both high quality content and relies on effective learning designs, learning scenarios and pedagogies that are aligned with the learning objectives. Technology itself can play only a minor role and should provide meaningful affordances to stimulate learning activities. The choice of technology should be aligned with the objectives and embedded in pedagogies and didactics. Several of the studies and meta-analyses indicate the use of innovative pedagogies such as inquiry-based learning and collaborative learning (Zhang et al., 2022) that rely on innovative technologies. When applied properly these pedagogies and technologies can have beneficial effects on student engagement, promoting feeling of presence and inclusion (Logemann et al., 2022).

Important for a teacher professional development programme to become and remain effective is not to focus on content only. Professionalization should address the teachers' needs, cater for their process of change and motivation, provide sufficient support from policy and management (e.g. considering workload), facilitate learning strategies and disseminate not only knowledge, but also skills and attitudes for various forms of online teaching and learning (e.g., (Gogus, 2021; Philipsen et al., 2019; Schildkamp et al., 2021)). This includes creating a culture of presence, interaction and community, supporting each other, building a learning community and paying catering for teachers' perspectives and perceptions.

The pandemic highlighted a variety of factors that are relevant, even when not immediately apparent as part of online education. Conditions and factors like student readiness, home and family life, access not only to tools, platforms, devices, but also to safe and secure places to study and work. More than in classroom situations, staff need to pay attention to student wellbeing and need to learn how to notice signals.

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6. Acknowledgements

Implementation of the Digital Distance Learning Switch for the "Computer Architecture" Laboratory Course During the COVID-19 Pandemic

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Abstract

In the middle of the 2019-20 academic year, COVID-19 pandemic triggered a switch towards digital education in Greece, at all levels, including Higher Education. This new reality created a whole set of issues and challenges on how to maintain education practice, quality, and assessment because of the instant transformation of face-to-face teaching to online teaching including all associated workflows. This paper reports on the changes of the digital switch regarding our Computer Architecture laboratory course, a subject offered by the University of Patras within the School of Engineering and specifically in the department of Computer Engineering and Informatics. The report focuses on changes within a time span of approximately 8 semesters, half of them offered with traditional methodologies and the remaining exclusively with distant digital learning.

Keywords: blended education, online and distance education, synchronous hybrid education, informatics.

1. Introduction

All Greek Universities, except for the Hellenic Open University, offer full time undergraduate and postgraduate courses where students' physical presence is required in most cases. This is a mandatory requirement for laboratory classes. Polytechnic schools offering 5-year engineering courses heavily rely on hands-on experience because a graduate computer engineer must successfully combine theory with practice and work for full stack development of real, contemporary computer systems. In the beginning of the 2020-21 academic year, the COVID-19 pandemic emerged. All face-to-face activity was suspended (lockdown) (European Centre for Disease Prevention and Control, 2022). Teaching had to be transformed into online - distant learning including all associated workflows, otherwise students would miss valuable semesters of studying. Although traditional universities were not initially designed for online teaching, the aforementioned course organisers based on modern internet platforms and their extensive working experience in distance learning practices adopted from the Hellenic Open University, managed to completely transform a laboratory course into an e-learning course. In this paper, the implementation of the Digital Distance Learning Switch for the "Computer Architecture" Laboratory Course is presented as follows: section 2 presents an overview of the taught laboratory courses, section 3 presents the digital learning switch, section 4 discusses some findings on the digital course implementation and section 4 summarises the final conclusions.

2. Computer Architecture Laboratory Courses

The Computer Architecture Course spans over two semesters and provides both theory and laboratory assignments for 2nd year students in the Department of Computer Engineering and Informatics, University of Patras, Greece. More specifically, the lab courses focus on low level assembly language and micro-level programming, thus allowing students to get hands on experience by examining the internals of a computer system.

Computer Architecture I laboratory courses provide five exercises on ARM assembly programming based on an ATMEL board (Fig. 1) (ATMEL, 2006).
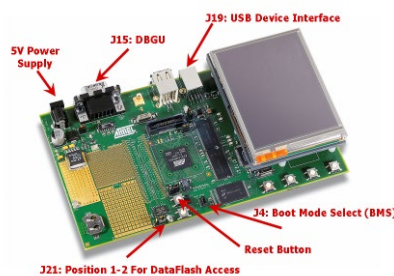
Figure 1: AT91SAM9261-EK evaluation kit.

This board is an AT91SAM9261-EK evaluation kit which is an effective platform for evaluating chip performance and for developing code for applications based on the AT91SAM9261 Central Processing Unit (CPU). Examples of concepts emphasized during the course are:

- Numerical systems (hexadecimal, binary)
- Positive – negative arithmetic
- Handling of binary numerical data (word, halfword, byte, integers, arrays)
- Registers, Arithmetic and Logical Unit
- Status Register and Flags
- Registers and memory addressing
- Low level debugging
- Assembly level programming structures (conditional statements, loops)

Computer Architecture II laboratory course also incorporates five exercises but this time at a lower binary micro-programming level so that computer architecture internals are more exposed to programming controls. As a result, there is even more deeper understanding to how programs can control a digital computer system. The board used for this specific class is a custom AMD Am2909 based board with micro-programmable memory (Nikolos et al., 1993) (Fig 2).
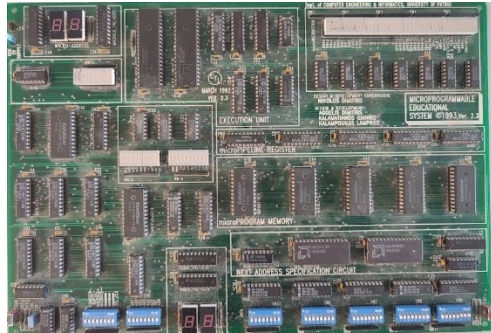
Figure 2: AMD Am2909 based board with micro-programmable memory.

Example concepts that are emphasized during the course are:

- Advanced Computer Architecture concepts
- Fetching and Executing CPU instructions
- Internal CPU opcodes
- Data bus – Address bus – Special Purpose Registers
- Low level memory and register file handling
- Handling of binary data and instructions
- Design and implementation of instructions using binary opcodes and formats
- Logical and arithmetic operations
- Very low-level debugging in binary mode
- Low level programming structures

The course workflow is implemented with physical presence in a computer laboratory with 18 workstations – boards accommodating 36 students in a two-hour session per two weeks (Fig. 3). About 350 students acquire hands on experience on board programming which is a mandatory requirement for this course, submitting five assignments (one every two weeks).

Figure 3: Computer architecture laboratory class.

Assignments are essential, as there no other way to evaluate software products and their understanding by the students. For the same reason there is a final written examination for every laboratory course, to ensure proper evaluation individual performance within each class.

3. Digital Distance Learning Switch

In early 2020, when the first COVID-19 cases were identified in Greece, almost every social activity was paused and there was a lockdown in effect. Universities had to stop all activities and students had to return to their homes. As a result, all taught courses had to be switched to distance e-learning courses. Laboratory courses workflows had to be adjusted accordingly or be suspended.

For synchronous communication with the class, it was necessary to switch to videoconferencing by utilising the zoom platform (Zoom, 2022). For asynchronous communication the e-class platform (Open eClass, 2022) was provided by the Greek University Network Infrastructure.

Online zoom meetings (Fig. 4) were organised on a weekly basis in order to support students and cater for online live lectures.
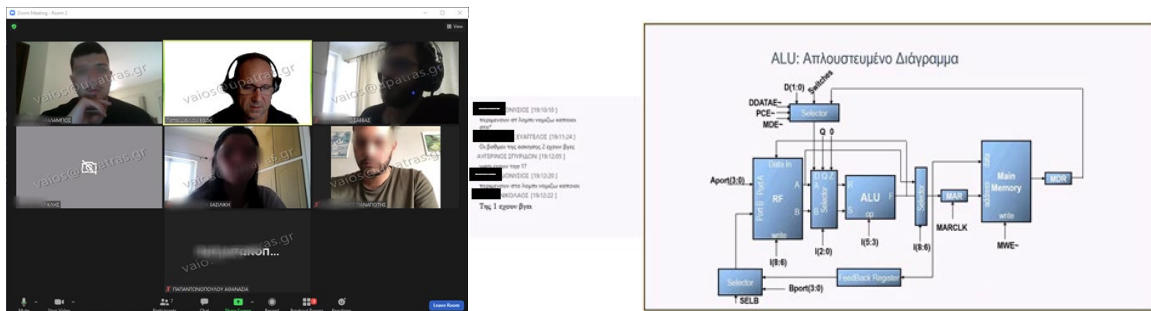
Figure 4: Online Zoom class meetings.

These meetings acted as virtual classroom which is substitute for in class communication, problem solving and teaching. It was possible to communicate with the whole class or accommodate "zoom rooms" for students working in teams. Videoconferencing was also used for weekly oral examination for some randomly selected students.

Apart from synchronous communication the open e-class platform (Fig. 5) served as a basis for asynchronous exchange of information and online material among students and lecturers. All available course material such as books, manuals, assignments were converted in digital form and distributed to the students who were enrolled in distinct laboratory teams.

Figure 5: E-class online platform.

All announcements and messaging were implemented using e-class and its automated platform email notifications. E-class was also used for submitting and marking students' assignments and as a final examination synchronous online platform. During the examination multiple choice questions from a pool of exam questions were randomly assigned to students who had to provide answers within a specific timeframe in order to avoid plagiarism. All examination questions had to be transformed into digital format and formed a large question pool (Fig. 6).

Figure 6: E-class online exam question example.

Another task for the digital switch was the transformation of class hardware boards into a form that students could use. It was decided that emulators would fit ideally for this purpose, and they could also be distributed online via e-class to students. For the Computer Architecture I – assembly programming course there was the choice of the official ATMEL board emulator named "KEIL" (Fig. 7).
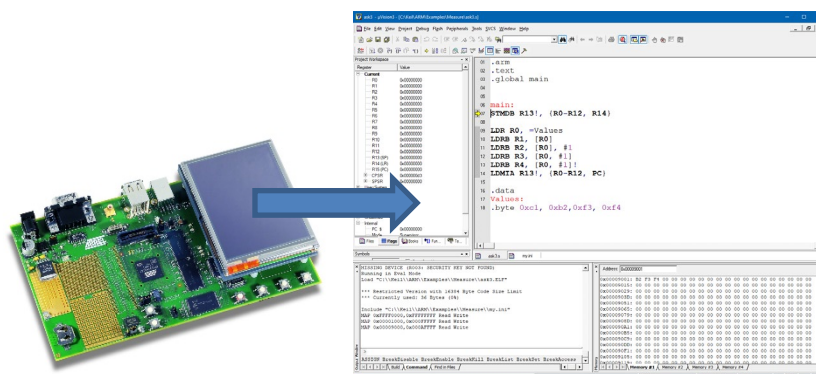
Figure 7: Assembly programming board emulator.

This emulator enabled students to install the platform on their personal computer so that they could develop required programs working in pairs and submitting assignment results via e-class for marking.

For the Computer Architecture II – low level micro-programming course there was the use of a custom emulator (Fig. 8), so students followed the same workflow as the previous semester.
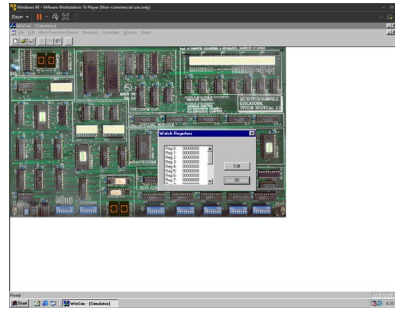
Figure 8: Custom micro-programming board emulator.

4. Course Evaluation Results

As traditional universities do not cater for official distance learning evaluation results, since they only offer courses with physical presence, there are no official statistics. Nevertheless, the course organisers can still monitor results such as student enrolment and exams performance and compare statistics before and after COVID-19 lockdowns.

Regarding the Computer Architecture I laboratory course, the following participation statistics were recorded (Table 1) for the academic years 2018-2019 (pre COVID), 2019-2020 (just when COVID started in Europe), 2020-2021 (lockdown) and 2021-2022 (after COVID lockdown):

Table 1: Computer Architecture I laboratory course students' enrolment.

Computer Architecture I	Enrolment							
2018-19		2019-20		2020-21		2021-22		
Labs	Exams	Labs	Exams	Labs	Exams (online)	Labs	Exams	
241	287	373	436	345	356	300	358	

It can be noted that there are new students who attend the class every academic year, but in the final exams there are also older students who have not managed to succeed in the final lab exams in the past. Due to the advantages of remote attendance, many older or working students have managed to follow the course, so the enrolment numbers increased. The overall success levels of students who successfully completed the class is presented in Table 2:

Table 2: Computer Architecture I laboratory course students' successful course completion.

2018-19	2019-20	2020-21 (online)	2021-22
56.91%	59.46%	82%	69.15%

Due to larger enrolment numbers but also due to the nature of the examination, success numbers were increased. This was because multiple choice questions provide discrete levels in marking and when combined with oral examination, together with the special circumstances that students were experiencing, there was a greater opportunity for success. Compared to ordinary written exams students could explain more about their understanding on the course main concepts instead of a written paper.

Regarding the Computer Architecture II laboratory course, the following enrolment statistics were recorded (Table 3) for the academic years 2018-2019 (pre COVID), 2019-2020 (lockdown), 2020-2021 (lockdown) and 2021-2022 (after COVID lockdown):

Table 3: Computer Architecture II laboratory course students' enrolment.

Computer Architecture II	Enrolment						
2018-19		2019-20		2020-21		2021-22	
Labs	Exams	Labs	Exams (online)	Labs	Exams (online)	Labs	Exams
390	375	350	475	334	362	236	229

In Computer Architecture there also increased enrolment numbers as well success numbers as presented in Table 4:

Table 4: Computer Architecture II laboratory course students' successful course completion.

2018-19	2019-20 (online)	2020-21 (online)	2021-22
49.57%	81.29%	65.9%	62.00%

It can also be noted that especially during the first online final examination there was an opportunity for older and possibly remote students to complete the course successfully.

5. Conclusions

Traditional Universities are essentially not designed for distance learning methodologies other than physical presence courses. COVID-19 Pandemic enforced immediate e-learning practices which could not be applied successfully if there was no previous working experience. This experience on platforms, tools and practices on Distant Learning was feasible since, in this case, all teaching staff involved are also members of the Hellenic Open University adjunct staff.

Several advantages emerged from such a practice. The dissemination of course information and electronic material was wider compared to printed material and in person exchange during a traditional class meeting. Course meeting arrangements with the whole class or group of students were easier and remote from home since there was location and time independence. Older, remote or even working students have found the opportunity to attend the laboratory class which was much harder in the past since it involved obligatory physical presence.

As side effects of the whole process there is the lack of "real" social interaction which was especially true for remote and new students. Students missed the experience of a "real" university atmosphere for 2nd year students, but they were working from their homes instead. Another side effect was the increased volumes of communication, emails, announcements and videoconferences since there was no other way to communicate with students or replace physical presence workflows. Online teaching material development was time consuming with very strict deadlines. Final exams were the harder to implement since exam questions had to be transformed to online format but also to ensure proper evaluation and secure wide plagiarism incidents.

On the positive side, COVID accelerated the digitisation of processes and study materials. Traditional universities adopted these practices and technologies which can now also act as a backup failover mechanism

for many situations such as possible longer-term disruptions of university attendance. Concepts such as digital signatures, electronic material and digital communication are now regarded as essential. Finally, this immediate switch would not be possible without the contributions of widely accepted institutions such as the Hellenic Open University.

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Metaverse in Online Distance Education: Superfluous or Inevitable?

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Abstract

The Metaverse is an emerging networked technology and buzzword in the field of Entertainment, Business and eventually Education. The Metaverse is projected to become an open network around social, multiuser platforms and persistent mixed immersive worlds enabled by Virtual Reality and Augmented Reality. From this point of view, is it safe to assume that it will be useful for Open, Online Distance Education or not? This study intends to illuminate essential aspects of the Metaverse, spark an insightful discussion in an organized fashion, capture critically multiple views and pin-point eventual fields where the Metaverse can be useful for Online Education and Distance Teaching Universities.

1. Introduction

The field of Open Online and Distance Education (ODE) has a history and tradition of several decades. It has broadened the education horizons of millions of people around the world facilitating their personal and professional development (Garrison, 1985; Kovanovic et al., 2015). The COVID-19 pandemic has revealed the importance of having systems adjacent to physical instruction. Furthermore, it accelerated the adoption of digital and online education. Here it should be noted that the wide unpreparedness of the educational systems led to the rapid implementation of remote emergency teaching models which have qualitative and quantitative differences from ODE (Hodges et al., 2020). The Metaverse is an emerging networked technology and buzzword in the field of Entertainment, Business and eventually Education (Park & Kim, 2022). The Metaverse is projected to become an open global network around social, multiuser platforms and persistent mixed immersive worlds enabled by Virtual Reality and Augmented Reality (Mystakidis, 2022). This study focuses on the question whether the Metaverse be useful for Open and Distance Online Education or not.

2. Dimensions of Open Online Distance Education

ODE has a service lifecycle that includes multiple stages and focal areas illustrated in Figure 1. The academic leadership and management formulate the vision, strategy, policies and objectives. These are implemented by administrative and supportive services. In the heart of ODE are the offered educational services, courses, degrees and educational programmes involving Teaching & Learning processes. Given the transactional distance between academic instructors and students, the learning material & content plays a key role for significant learning. Learning material in ODE contains and orchestrates activities that promote cognitive engagement and encourage interactions between students with content and among peers. The educators' role is to facilitate the learning process through frequent communication and by organizing synchronous online meetings. The evaluation of student progress and performance is another key procedure to ensure the attainment of the intended learning outcomes. Although evaluation is often implemented through testing, in many contexts it is recommended to feature authentic, realistic tasks. Research is another academic pillar of ODE linked to postgraduate, doctoral and postdoctoral projects. Publicity and marketing actions toward the public and specific target audiences serve the attraction of students and other recipients of offered services.

Student life is another important aspect of an academic community that is a stronger priority in brick-and-mortar universities around cultural activities, events, student clubs and associations.
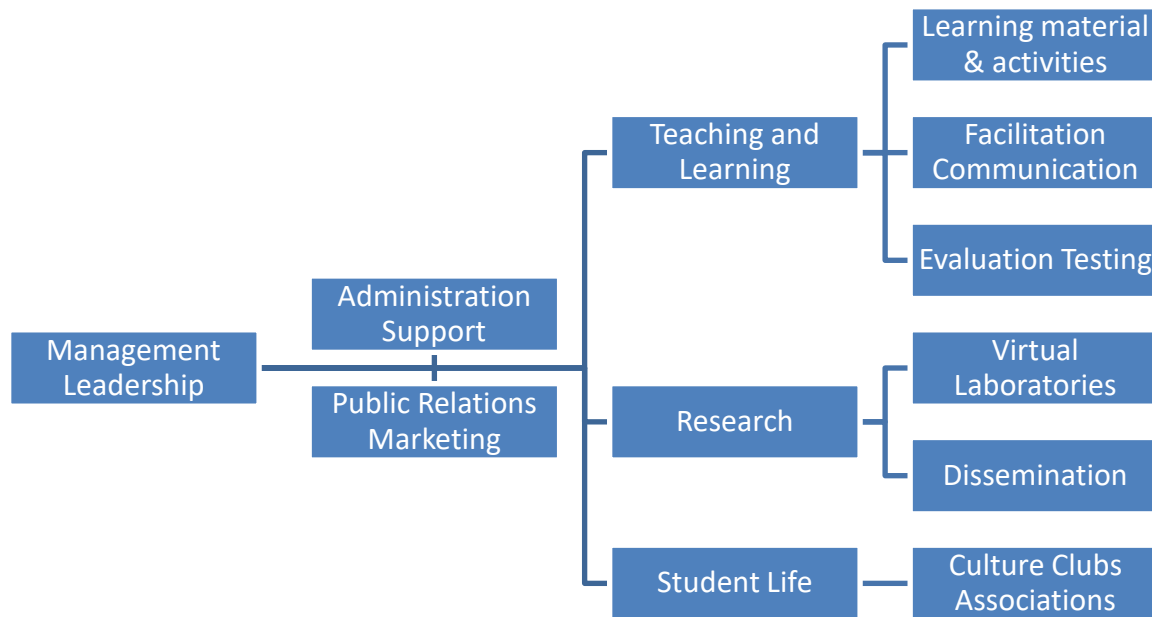
Figure 1: Main Processes in ODE.

3. Metaverse and Open Online Distance Education

The Metaverse is projected to become the 3D iteration of the Internet, a web of open and private virtual worlds. The Metaverse is not expected to replace the core online interactions. It will augment human capabilities and in time these can render older technologies obsolete in specific use cases. Although the Metaverse is not fully developed, parts of it, technologies and interoperable platforms and resources are being created daily. Some examples are avatar generators based on physical appearance, conversational agents based on artificial general intelligence and speech to text conversion, virtual economy currencies and multiuser social VR platforms (Hartholt et al., 2019).

From this perspective, it can be argued that the Metaverse and its underlying technologies can be instrumental for aforementioned processes in ODE. Indicatively, learning material can be augmented by learning experiences that promote exploration and student agency such as playful scavenger hunts (Mystakidis, 2021b). Facilitation meetings with instructors be organized in co-located environments simulating effectively meetings in physical spaces (Mystakidis et al., 2017). Evaluation can focus on the performance of authentic tasks in realistic spatial settings (Kye et al., 2021). Research and education on procedural competences can be extended when conducted in virtual simulated laboratories (Kiourt et al., 2020; Marks & Thomas, 2022). Even more importantly, the Metaverse can be instrumental in breaking learner isolation in ODE; informal meetings student groups in virtual third spaces can facilitate community building around peer-to-peer student communications and interactions (Mystakidis, 2021a).

4. Discussion and Conclusions

Is the Metaverse superfluous or inevitable in ODE? Clearly distance teaching universities operate and flourish today so perhaps the Metaverse is not needed. Ubiquitous technologies are influencing the field of ODE. The Internet and the world-wide web brought ODE online and gradually replaced analog paper-based systems.

Learning and information management systems became indispensable digital infrastructures of almost every educational institution. Web conferencing software and online platforms have been the predominant solution to organize live online educational meetings and lessons. However, other technologies have had a peripheral adoption rate in ODE. Social media have been used as auxiliary media in ODE and not as the sole virtual environment of formal teaching purposes. Mobile devices have been used as flexible access devices for online resources, replacing desktop computers but again they did not lead to a profound breakthrough or change of paradigm in ODE. Where will the Metaverse fall in this spectrum? Will it become a new commodity or a peripheral, auxiliary technology for ODE? In this landscape, it is useful to consider that ODE spans beyond higher education. The Metaverse can extend and expand the scope of formal ODE towards vocational education and training (Kim et al., 2020) as well as online schooling. Ultimately, the answer to the incremental versus radical innovation dilemma by each higher education institution will determine their strategy and vision towards future-proof ODE.

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Multi-User Virtual Laboratory: Soft Aspects of Hard Science

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Abstract

As collaboration has become a 21st century trend and online learning has blended into the mainstream of education, there is a need to re-consider learning instruction by taking into account the multitude of e-learning environments. Computer-supported collaborative learning is an educational approach that not only connects remote peers but also uses technology to shape interactions, a most important factor in enhancing learning in science courses. In this study we investigate the benefits of collaborative learning in a virtual reality science lab environment. We converted Onlabs, a single-user, 3D, desktop-based virtual reality educational software that simulates the environment of a biology lab, to a collaborative application. In the Onlabs original version, the users could be trained and familiarized individually on the instruments and equipment of their biology experiments, through audio and written instructions that appear on the PC screen. However, in the presented enhanced Onlabs version, multiple users can now collaborate in the virtual lab and interact as a group of peers to implement a specific experiment, while the lab tutor is also present, but only as an observer. The main axis of our research is the operation of a photonic microscope, one of the basic instruments in a biology lab. A sample of Lyceum learners from a secondary education school in Greece, was partitioned into three groups to be trained on the microscopy experiment by three different educational scenarios. The first group was conventionally trained in the physical lab, the second group was trained in the computer lab using the single-user mode of Onlabs and the third group was trained also in the computer lab using the multi-user mode of the software. Finally, the acquired laboratory skills were assessed in the physical biology lab, where all three groups were asked to use a photonic microscope and focus on a given specimen. Our study provided an initial body of evidence that collaboration and social interaction in a multi-user virtual reality learning environment contributes to higher performance regarding the achievements of the learning goals. Still, the concurrent presence of several people in the same virtual space, which does not come with socially relevant complementary cues, such as body language, seems to elevate the stress level of some participants, therefore

rendering the whole set-up as worth investigating from a variety of angles. With the certain assumption that physical labs are essential in science courses, there is a need for institutions to become attuned to this new need of the digital age to design educational scenarios that are based on technological innovations.

Keywords: distance education, multi-users virtual laboratories, desktop-based virtual reality, collaborative learning.

1. Introduction

The teaching methodology of Science is changing rapidly due to the development of technological applications that can be incorporated into the learning procedure (Elme et al., 2022). However, it is not always feasible to offer graduate students specialized spacious labs, updated equipment and enough lab instructors, especially nowadays that many educational institutions face financial problems (Hess, 2021; Sheng & Zhao, 2021). Universities may struggle to meet the traditional prerequisites that guarantee quality in science laboratory education and as a result, they try to change the way science subjects are being taught. Additionally, the classical teaching scenarios in science laboratory courses are no longer appealing to the new generation who is born and lives in a digital age where technology dominates her life (Paxinou et al., 2018a). This generation favors universities that exploit the promising potentials of the digital technology in order to modernize the teaching methodologies (Paxinou et al., 2022). The "digital natives", as so aptly called by Mark Prensky (2001), seek for cool ways to access knowledge asynchronously, and from any location.

In order to boost students' engagement with lab science, today's educators, even those who until recently were not in favor of the synchronous or asynchronous online learning, are exploring the educational potentials of the digital technology. Virtual Reality (VR) is a cutting-edge technology that can be used in online learning to display a wide range of lessons (Ott & Freina, 2015; Garzon, 2017; Xu, 2018; Fernandes & Damasceno, 2021; Paxinou et al., 2022). Depending on the equipment used, VR vary in the level of immersion the user experiences (Bowman & McMahan, 2007). Desktop-based VR may offer a low-immersive experience, whereas a head-mounted display offers a high level of immersion (Cummings & Bailenson, 2016). Desktop-based VR is easy to use and most importantly, it does not acquire specific and expensive equipment: a PC, a keyboard or a mouse are all the user needs. In a, as realistic as possible, desktop-based VR environment, the user can experience any task, even those who are difficult or dangerous to perform in the real world.

Many studies present that desktop-based VR may promote affective autonomous learning processes and engage students in the learning process, in many different scientific fields (Yang et al., 2018; Parong & Mayer, 2021; Paxinou, 2021a, 2021b, 2021c). As a result, a VR application can be included in a distance learning educational scenario in science lab courses, in the sense that it promotes the independent and self-directed construction of knowledge. On the other hand, the collaboration, the interaction and the communication between the learners in the physical lab environment is essential, as they contribute to content learning and development of laboratory skills (Thrope, 2002). In this study we use a multi-user VR application, as an attempt to combine the autonomous and the collaborative learning, two contrasting concepts that are both essential in distance learning environments (Paulsen, 1993). In particular, we investigate whether an instruction-assisted, multi-user, collaborative VR educational software can help students acquire the basic hands-on science skills that are essential for performing their experiments in the physical biology lab.

In our research we compare the performance of students who were either trained on the microscopy experiment with the traditional face-to-face methodology or with the single-user version of a VR educational software or with the multi-user collaborative version of a VR educational software. We use the VR application named Onlabs, an interactive virtual lab that simulates basic lab experiments that usually occur in a biology

wet lab. Onlabs is a digital educational material that is offered to distance learning students enrolled in the postgraduate program "Studies in Natural Sciences" at the Hellenic Open University (HOU). Students that attend the laboratory biology modules of this program, are prepared for their lab experiments by interacting with the virtual lab equipment of Onlabs, at home. In other words, the students except from studying the given printed material or watching the educational videos, they are practicing on their experiments by distance, via Onlabs before appearing in the university premises to conduct live the same experiments.

In this empirical study, in order to give answers to the research questions, three groups of students enrolled in a biology lab course, were educated in the microscopy experiment following a different training method: the traditional face-to face lab tutorial in the physical lab or the private self-training trough interaction with a virtual microscope or finally the collaborative training trough interaction with a virtual microscope. The study provided indications that collaboration in a multi-user virtual reality learning environment contributes to higher performance, regarding the achievements of the learning goals of a science laboratory course.

2. Background and Related Work

As mentioned in the previous chapter, a virtual biology laboratory class, supplied with high level of immersion and interaction, could serve as a powerful tool for initiating students to the daily routine in the on-site laboratory, enhancing and further enriching their practical experience (virtually though) and offering them the opportunity to experiment safely and unrestrictedly on things they could not do in reality and learn by trial-and-error. Such realistic and instructive virtual labs are Labster, developed by the Danish multi-national company of the same name[1], and Learnexx 3D, developed by Solvexx Solutions Ltd, based in the UK[2].

The Second Life platform has also been used for the virtual recreation of medical procedures, where the users are being trained in providing healthcare and medical services. Imperial College's Virtual Hospital and Polyclinic and University of California's Virtual Pharmacy consist of some of Second Life's most characteristic medical worlds (Lee & Berge, 2011).

In the past, several interactive computer-based applications for science and biology learning have been developed and tested and claimed encouraging learning results. For example, 212 junior high school students (13-14 years old) in Greece were provided with an interactive 3D animation, accompanied by narration and text, dealing with "methods of separation of mixtures" which in general, did increase the students' interest in science (Korakakis et al., 2009). Also, 44 magnet science and medical technology high school students (17-18 years old) in Texas, USA, improved their molecular biology skills by using a computer-based simulation designed for training in the production of a transgenic mouse model, independently of their previous knowledge of it (Shegog et al., 2012). Moreover, a virtual world under the name of Multiplayer Educational Gaming Application (MEGA) was designed for and used by 131 US college prep students in which they had to solve a CSI-like murder case using their skills of scientific inquiry and eventually, 94% of the participant students practiced successfully their basic scientific skills to solve the case (Annetta et al., 2010).

3. Onlabs Virtual Biology Laboratory

Hellenic Open University has been developing its virtual biology lab, Onlabs, since 2012; from 2012 to 2015 under Hive, a 3D game engine developed by Eyelead[3], and from 2016 until today under Unity. Onlabs's main

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[1] https://www.labster.com/

[2] http://learnexx.com/

[3] A computer game company based in Athens, Greece.

traits are its state-of-the-art 3D graphics and realistic interaction simulation. In Onlabs, the user navigates with the arrow keys and interacts with the simulated instruments with the mouse and performs virtual experiments.

3.1 **Single-user version of Onlabs**

Latest stable version of single-user Onlabs is version 2.1.2 and can be downloaded from our website[4] for free. It includes the simulation of two separate experiments, those of the microscoping of a test specimen and the preparation of 500ml of 10X TBE water solution. The first procedure involves the setting of the photonic microscope and the creation of a test specimen as well as its microscoping with the microscope's objective lenses, while the second one involves the weighting of boric acid and trizma base powders and their dissolution in water with the magnetic stirrer along with the addition of EDTA pH 8.0 and water to the produced solution. It also includes three different modes of playing, those of *instruction*, where the human user is guided by voice and text and is allowed to perform only the suggested move each time; *evaluation*, where the human user is free to make any move they want with respect to the selected experiment while being evaluated on their performance; and *experimentation*, where the human user is free to make any permitted action they want with all equipment available from both simulated procedures and without receiving any evaluation. A screenshot of Onlabs 2.1.2 is shown in Figure 1.

Figure 1: A screenshot of Onlabs latest version 2.1.2.

2.1. **Multi-user version of Onlabs**

The collaborative multi-user version of Onlabs is based on single-user Onlabs version 2.1.2 and has incorporated the single-user features in the latter's Instruction Mode and for the moment, concerns only the microscoping procedure. It runs as a desktop application on Windows and Mac systems. For the conversion of the single-user version to the multi-user one, we used a plug-in package (PUN2 Free) of the Photon Engine[5]. Multi-user version of Onlabs is described below.

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[4] http://onlabs.eap.gr/
[5] https://www.photonengine.com/

At first, each student chooses a nickname and finds an existing room, or creates a new one (Figure 2).
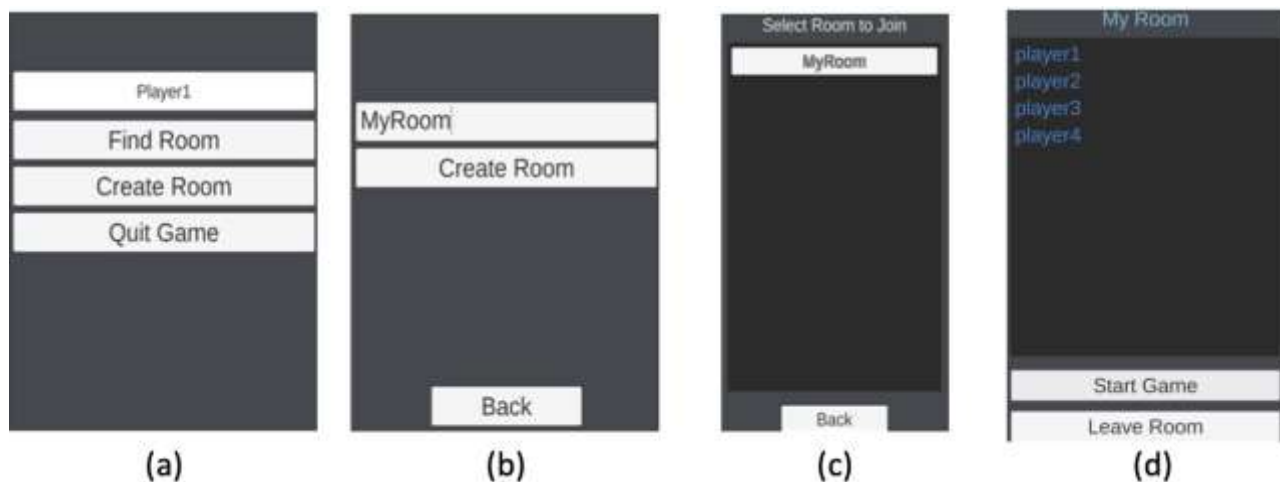
Figure 2: Menus for the configuration of multi-using.

As soon as all students have joined to the same room, master client (room owner) starts the game. The students are simultaneously transferred to the virtual lab, in front of a bench with 4 microscopes, and a message with the first instruction appears on all users' (players') screens. Each microscope has the nickname of a student on a tag over it (Figure 3) and each student needs to navigate to the respective microscope.

Figure 3: Scene of the virtual lab when all users (players) have joined.

The students interact with microscopes parts through the mouse and each one has to correctly follow the particular instruction. A step is completed when the respective instruction is followed by all of the students. After the completion of a particular step by all students, the latter are prompted with the next step. If, however, someone cannot implement the instruction, there is the option of asking for help.

Help function is implemented by selecting from a drop-down list of joined students the student to be called for help, and pressing the help button (Figure 4). When help button is pressed, a message for help is being shown to all students (Figure 5) and the student chosen to help is allowed to perform the required action on the microscope of the student who made the request.

Figure 4: Selecting player from a drop-down list.

Figure 5: Help message that appears on all players' screen.

The training process is completed when all learners (players) have correctly implemented all the required 25 steps.

4. The Empirical Study

In science education, there is a debate between the traditional and the VR lab, as "*the former offers a unique hands-on experience and a positive research-training environment with a social experience of working with others, whereas the latter offers safe and repeated practice in combination with a unique engaging feeling*" (Paxinou, 2020:3). Additionally, many studies indicate that training in a collaborative VR environment leads to better learning outcomes. According to Papanastasiou et al., (2019) such collaborative experiences enhance the ability to memorize and to build the knowledge in new concepts. On the other hand, researchers like Choi & Baek (2011) argue that there is no substantial difference in achieving the learning goals when comparing a VR collaborative learning environment and a face-to-face survivorship training. In order to take part on this debate, we conducted an empirical study to give answers to the following research questions:

(a) The instruction-assisted multi-user collaborative version of Onlabs software may help students acquire the basic hands-on science skills that are essential for conducting their experiments in the physical lab?

(b) Finally, which group of students has better performance in conducting an experiment in the physical lab? The group who was trained by following the traditional teaching method or the two groups who were trained through interaction with the virtual instruments of the Onlabs software?

4.1 The Participants

The sample consisted of 12 upper secondary education (Lyceum) students from the city of Lefkada in Greece. The Lyceum students were enrolled in a biology course, a course where, among other tasks, they are practicing in biology experiments in the school lab. This sample represents a novice audience that brings a zero to minimum prior knowledge on the operation of a photonic microscope. The students were divided into 3 groups to be educated on the microscopy experiment with a different teaching methodology.

4.2 The Educational Scenario

The educational scenario was completed in 2 phases. The purpose of the 1st phase was to train the students on the specific experiment, whereas the purpose of the 2nd phase was to perform the experiment in the real lab and evaluate this performance.

The 1st Phase

During the 1st phase, the 12 students were divided into 3 groups of 4 students each, and were educated in the microscopy experiment by different methodologies (Table 1). The Group A entered the biology school lab and watched the biology teacher performing the microscopy experiment. Then each students tried to operate the physical microscope on his/her own. The Group B entered the computer school lab and each student used her/his own PC to interact with the single-user version of the Instruction Mode of Onlabs. The Group C entered also the computer school lab but the learners of this Group interacted with the new multi-user version of Onlabs. The training of all three groups lasted almost 20 minutes.

Table 1. The 2 phases of the empirical study scenario.

	1st Phase		
	• Training in the Microscopy Experiment		
Group	A	B	C
Location	Biology school lab	Computer school lab	Computer school lab
Duration	20min	20min	25min
Learning Methodology	Face-to-face lab tutorial	Interaction with the single-user version of Onlabs	Interaction with the multi-user collaborative version of Onlabs
	2nd Phase		
	• Performing the Microscopy Experiment in the Real Lab with a Real Microscope • Evaluation of the Laboratory Skills		

The 2nd Phase

During the 2nd phase, all 12 students entered the school biology lab to conduct the microscopy experiment. The biology teacher was watching them to evaluated their performance. This evaluation was based on a questionnaire specially designed by E. Paxinou (2020:159). According to this questionnaire, the complete microscopy experiment was divided into 24 steps. The students had to follow the instructions of these 24 steps in the given order. After completing (or not) each step the teacher had to tick on one of the three following options: (a) the student performed the step easily, (b) the student performed the step with difficulty or (c) the student was unable to perform the step and asked for help. A small part of the questionnaire (step 6 of the experiment) is presented in Table 2. It is obvious that those students who performed without difficulty most of the 24 steps, are the students with the highest performance, and the training methodology they followed is the favourite one.

Table 2: A part of the evaluation questionnaire.

Step Nº	6
Instruction	Rotate the revolving nosepiece so as to set the objective lens with the lowest magnification into position
Students' Performance *(Tick on one of the three options)*	(a) The student performed the step easily (b) The student performed the step with difficulty (c) The student was unable to perform the step and asked for help

4.3 **The Results**
1st **Phase**

In computer supported collaboration learning, educational processes are usually supported by text-based prompting tools that are used to help and make the interaction productive (Wang et al., 2017; Schnaubert & Bodemer, 2019). In the single-user version of Onlabs there is a globe button that offers the learners simultaneous written and audio hits (with exactly the same content) for each step of the experiment. In the multi-user version of Onlabs the learners have the option to call a classmate, who is also present in the virtual lab, to complete the step for them. So, in the 1st phase where the training occurred, two students from Group C used the above help functions in three cases. In the first case, a student asked one of his/her classmates to help him/her, without firstly using the globe button offered by the Instruction mode of Onlabs. In the other two cases, the students asked their classmates' help after using the globe button. In all these three cases, the

students who were called to help, responded immediately and successfully. Regarding Group A, in three cases, 2 students could not remember the names of the parts of the microscope they had to locate and handle. In Group B one student did not remember the name of a part of the microscope, while in Group C all students knew all the parts. The above results are an indication that the existence of both audio and written help hints in a virtual learning environment enhances the students' ability to memorize the new terminology, converging on the cognitive theory of multimedia learning which argues that learning is optimal when both the visual and auditory channels of memory are used to the same degree (Mayer, 2005; Mayer & Fiorella, 2014).

2ⁿᵈ Phase

Figure 6 presents the results of the students' evaluation in the biology lab, based on the questionnaire. The blue colour of the pies corresponds to the percentage of the "The student performed the step easily" answers out of the total answers in a Group, the orange colour corresponds to the percentage of the "The student performed the step with difficulty" answers out of the total answers in a Group and the grey colour corresponds to the percentage of the "The student was unable to perform the step and asked for help" answers out of the total answers in a Group. Although our sample was quite small, we can have an indication that the multi-user collaborative version of Onlabs helped the Group C to perform easily more steps of the microscopy experiment during the evaluation phase in the biology lab. None of the 4 students in the Group C asked for help in any step of the experiment (Figure 6(c)) and only 6% of the total answers of this Group corresponds to difficulty in performing a step (whereas this percentage was 13% and 11% for Group A and B respectively).
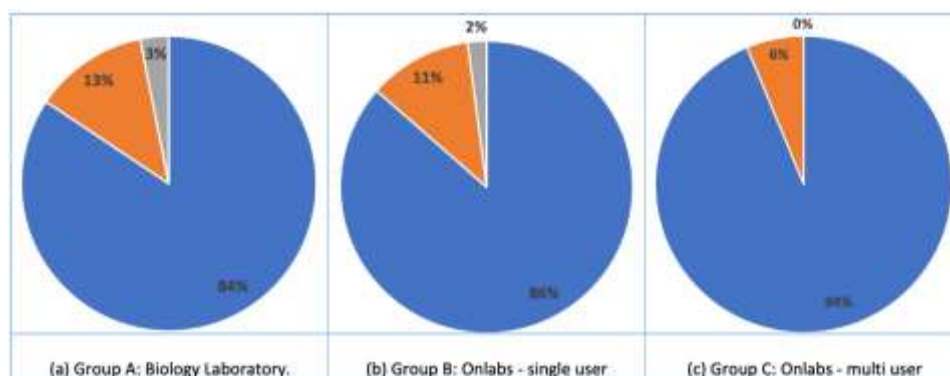
Figure 6: Evaluation of the students' experimental skills in the biology lab.

The data above indicate that the simultaneous presence and the use of collaboration and interaction tools in a virtual learning environment contribute better to the achievement of the learning goals of a biology course compared to the use of a single-user VR software or the participation in the traditional lab tutorial.

5. Conclusions and Future Works

The educational community tries to absorb the impact that technology has on teaching and learning. It is important that the instructors explore its potentials to modernize their teaching methodologies. In this study we attempt to help instructors move towards this direction by presenting an educational tool, the multi-user Onlabs, that can help learners practice on their lab experiments, remotely. The multi-user Onlabs software uses VR technology and simulates the equipment of a biology lab where 4 students perform the microscopy experiment in a collaborative environment. In this study we also demonstrate the results of a preliminary empirical study where three groups of Lyceum trainees are educated in the microscopy experiment by

following different learning methodologies. The acquired laboratory skills are finally assessed in the physical biology lab as an attempt to evaluated the followed learning methodology: training in the physical lab by attending the face-to-face lab tutorial, training with the single-user or with the multi-user Onlabs. Our research resulted to some indications that the Group C, that was trained in the microscopy experiment in the virtual collaborative environment of the multi-user Onlabs, where the learners could interact synchronously with other trainees (as it usually happens in a real lab), were better educated in the experiment than Group A, or Group B. During the training, the learners in Group C preferred to ask help from their classmates than using the automated hints offered by the software. This students' behavior indicates that collaboration and communication in a science lab (even if we are referring to a virtual lab) enhance learning and lab performance. Additionally, the learners from Group C could remember the name of all parts of the microscope during the evaluation phase in the physical lab, whereas there was some cases where students from Group A and B could not locate some parts.

The proposed software is a modern, safe and engaging tool that can be used in crisis situations, like the latest pandemic and it holds the promise of substantially reducing the carbon footprint of activities which, to date, rely heavily on transport for on-site practice.Future research could include the replication of the empirical study with a bigger sample. It could also include a scenario where students are fewer than the available instrument. In this case, more than one trainees would need to make use of the same instrument at the same time. Such scenario could generate many research questions about students' interaction in a multi-user virtual environment with shared equipment, and about the development of collaboration and interaction features from a technical point of view. For example, if someone is rotating the aperture knob of the microscope, will someone else be allowed to use the same equipment or not? Or, if someone takes the pipette from someone else's microscoping kit, how will it be recognized and what kind of interaction options might it have? Those and several other questions would naturally come up as an area of further research.

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Multivariable Analysis Methods On Online Discovery Learning/Constructivistic Approach Using Cognitive Tools

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Abstract

This paper focuses on studying the environment of online discovery learning/constructivistic approach using cognitive tools in higher Mathematics' education, via a combination of multivariable analysis methods, in particular multiple correspondence analysis in identifying factors and cluster analysis in identifying groups of students with similar characteristics, in combination with inferential statistics' methods.

Online discovery learning/ constructivistic approach using cognitive tools supports the utilisation of a combination of electronic worksheets designed and implemented via a cognitive tool, as Mathematica and online synchronous communication via the tools of a Learning Management System (LMS) and voice and video group calls.

The paper presents empirical research results of a case study concerning the approach's application at the Department of Statistics and Insurance Sciences of the University of Piraeus and focuses on students' attitudes towards the tools and the approach used. A mixed approach was used in the study, in particular a quantitative approach with open-ended questions. A questionnaire on students' attitudes towards the benefits and the disadvantages of the tools and the approach used was designed and implemented. 21 students participated in the study.

The comparative study of the multivariable analysis' results and inferential statistics' results provides the following results:

- There is the relationship between gender and the ability to operate the platform and software regardless of the communication with the teacher, which also emerged from the inferential statistics' analysis: the girls showed negative answers, while the boys were positive in general.
- A second relationship that arises is between computer experience and a positive attitude towards the features of the tools and the approach used. Greater computer experience correlates with a more positive view on most questions.
- Groups that considered the software used easy to operate and easy to learn also had a positive attitude towards whether their approach allowed them to act on their own, to formulate and test conjectures and to create personal representations, unlike groups who had a negative attitude or did not express an opinion.
- Groups with a positive attitude towards the possibility of students discussing with the teacher and with each other also had a positive attitude towards active participation. The relationship between the characteristics mentioned above and the provocation of students' interest cannot be tested, since almost all groups expressed positive attitudes towards their interest in the lesson.
- The relationship between students' interest in computers' use and their attitudes towards whether software is generalizable and has dynamic formalism cannot be tested, since all groups expressed positively about their interest in computers' use.

Keywords: Online learning, Discovery learning/constructivistic approach, Cognitive tools, Multiple Correspondence Analysis, Cluster Analysis, Inferential Analysis.

1. Introduction

Multivariable analysis statistics methods can be effectively used in handling data having being gathered in educational settings. The combination of multivariable analysis methods as Factor Analysis or Multiple Correspondence Analysis, that provide complex variables with Cluster Analysis, that provide homogenous groups of the objects of study regarding these complex variables, can help in the understanding of relations in teaching-learning environments. The theoretical background of the combination of such methods is presented in Behrakis (1999); also a research study in that direction is presented in Korres (2019), where Factor Analysis and Cluster Analysis were used.

This paper focuses on studying the environment of online discovery learning/constructivistic approach using cognitive tools in higher Mathematics' education, via a combination of multivariable analysis methods, in particular Multiple Correspondence Analysis in identifying factors and Cluster analysis in identifying groups of students with similar characteristics, in combination with Inferential statistics' methods.

Cognitive tools are used as a term both for describing artificial intelligence technologies used in student modeling and for describing tools used in construcivistic activities that promote discovery learning, exploration and social interaction (Lajoie & Derry, 2013). We use the term in the logic described by Jonassen (2000); that is computational tools that can function as intellectual partners of the students, while they are engaged in discovery learning/constructivistic activities. In this direction cognitive tools are computer learning environments that students can use while they are studying any subject; students can use and utilize the structure and the "logic" of the tool, in order to study the concepts, the properties and the principles of the subject (Korres, 2018). Cognitive tools also support, guide and extend the thinking processes of their users (Derry, 1990) and they reorganize (radically reconstruct) the way learners think (Pea, 1985).

Mathematica (Wolfram, 1996; Torrence & Torrence, 1999) can be considered as a cognitive tool, mainly because its mathematical operations, notation and objects are similar to the standard mathematical notation, it has a function–based structure, which allows us to define and study objects and quantities as functions, it offers possibilities in plotting graphs easily, quickly and precisely and in making complex calculations accurately and it offers possibilities for the students to create and test their own algorithms.

In the past, electronic worksheets in the form of spreadsheets have been used in order to help students with manual computations susceptible to arithmetic errors, via automatic calculation of data, requiring from students to think through the solution process (Orzech & Shelton, 1986).

Online discovery learning/constructivistic approach using cognitive tools supports the combination of cognitive tools with online synchronous communication. In particular, the approach supports the utilization of electronic worksheets in a discovery learning/constructivistic approach at a distance. The electronic worksheets can be designed and implemented via a cognitive tool, as Mathematica, while the synchronous communication can be designed and implemented via the online tools of a Learning Management System (LMS) and voice and video group calls (Korres, 2020).

The discovery learning/constructivistic approach using electronic worksheets as cognitive tools in higher Mathematics' education is presented in Korres (2018). The online discovery learning/constructivistic approach using electronic worksheets in higher Mathematics' education is presented in Korres (2020).

The multivariable analysis methods mentioned above are applied in empirical data obtained by a case study involving the approach's application at the Department of Statistics and Insurance Sciences of the University

of Piraeus. Data was obtained by the application of the approach using Mathematica to the course Calculus II (Functions of multiple variables) at the Department of Statistics and Insurance Sciences of the University of Piraeus; 21 students participated in the study, attending a series of Calculus II lessons at a distance.

2. Methods

2.1 Research questions

The research questions of the case study are: 1) "What are the dimensions (complex variables) that can be identified in the teaching-learning environment of the online discovery learning/constructivistic approach using cognitive tools in Mathematics' higher education? In particular the variables composed to complex variables (dimensions) are: i) gender and students' experience and attitudes towards computers' use, ii) characteristics of the LMS system used, iii) characteristics of the cognitive tool used and iv) characteristics of the online approach regarding discovery/constructivistic learning" and 2)"What are the characteristics of groups of students grouped in correspondence to these complex variables (dimensions)?"

2.2 The teaching-learning environment being studied

Online discovery/constuctivistic learning approach using cognitive tools, as presented thoroughly in Korres (2020), supports the parallel use of: (i) Electronic worksheets in the environment of a cognitive tool and (ii) a communication system in the environment of an LMS system in combination with voice and video calling and conferencing. The approach is based theoretically on Discovery learning, Constructivism, Social Constructivism, Social development theory and the concept of cognitive tools.

The online discovery/constructivistic learning approach was applied at the Department of Statistics and Insurance Sciences of the University of Piraeus. A server was created on the website of the Department, where E-Class platform by the Greek Universities Network (GUNet) was installed. An e-course on Calculus II (Functions of multiple variables) was created on the E-Class platform, having controlled access. As pointed out in Korres (2020), another LMS system that could be used in creating e-courses and offers possibilities for both asynchronous and synchronous communication is Moodle. Synchronous communication can be established via a combination of the "Chat" application of Moodle and an app which supports voice and video group calls, as Skype, Webex, Zoom or Facebook Messenger and Apple's FaceTime. Also Microsoft Teams is a platform that offers possibilities for asynchronous and synchronous interaction between students and the teacher and between students.

An experimental program was designed and implemented for students who signed up for the e-course Calculus II (Functions of multiple variables) at the E-Class platform. The cognitive subject selected is Calculus II, in particular the subjects of partial derivatives and multiple integrals. The program utilized both asynchronous and synchronous communication; in particular, it consisted of three parts: (a) teaching theoretical subjects, through the traditional narrative approach conducted by face-to-face teaching on campus, (b) teaching theoretical subjects through asynchronous communication and c) teaching properties, geometric interpretations, processes and applications of theoretical issues via the online discovery/constructivistic learning approach with the parallel use of electronic worksheets in Mathematica and communication at the LMS system in combination with group voice and video calls.

Students' attitudes towards the discovery learning/constructivistic approach using electronic worksheets in Mathematica, for face-to-face instruction in the computer laboratory, in higher Mathematics' courses, have been previously studied (Korres, 2018, 2019). The results showed positive attitudes by the students towards the cognitive tool used (Mathematica), towards the characteristics of the teaching approach relatively to the

principles of discovery learning/constructivism and towards the development of higher order thinking skills supported by the approach; they expressed neutral and slightly negative attitudes regarding whether they can use the tool independently of the presence of the teacher.

Students' attitudes towards the online discovery learning/constructivistic approach using electronic worksheets in Mathematica, in higher Mathematics' courses, have been previously studied (Korres, 2020). The results are briefly presented in the paragraph 3.1.

2.3 Statistics methods being used

After the completion of the experimental program, a questionnaire was given at the students that participated, including questions regarding: i) gender and students' experience and attitudes towards computers' use, ii) characteristics of the LMS system used, iii) characteristics of the cognitive tool used and iv) characteristics of the online approach regarding discovery/constructivistic learning.

Regarding research methods, the descriptive/investigative approach and the correlational approach were applied (Cohen, Manion & Morrison, 2013 and Korres, 2007). Regarding Statistics, methods from Descriptive and Inferential Statistics were used, in combination with multivariable methods, in particular Multiple Correspondence Analysis (MCA) and Cluster Analysis (Behrakis, 1999; Greenacre 1984; Korres, 2015; Norusis, 2008). MCA is a very powerful method, appropriate to be used on nominal or ordinal (or scale) variables, having as the only precondition for data (answers to the questions of a questionnaire or scores) to be coded as positive real numbers.

In our analysis we explored if there are groups of variables or students (objects) evolving a common meaning and whether this can be interpreted. In order to accomplish that, we applied Multiple Correspondence Analysis to our data set. The purpose of this method is to find transformations of the variables that are optimal, in the sense that the categories are separated from each other as much as possible. By this, we deduce that students having similar characteristics or attitudes will be plotted close to each other, while students having different characteristics or attitudes will be plotted as far apart as possible (Behrakis, 1999). Then, we applied Cluster Analysis to students using their coordinates in the complex variables (dimensions) obtained by Multiple Correspondence Analysis, in order to define homogenous clusters of students regarding the set of the main variables. In that manner, information is filtered with only its basic characteristics passing through and not some specific individual characteristics of the sample (Behrakis, 1999).

3. Results

3.1 Descriptive statistics

21 students participated in the study; 15 (71.4 %) were males and 6 (28.6 %) females. Regarding the students' experience in using computers, 52.4 % used computers from 1 to 3 years and 47.6 % for more than 3 years. Regarding the students' interest in using computers, the total of students showed positive attitudes (5 and above); moreover 90.5 % gave totally positive answers (6 or 7).

As presented in Korres (2020), students expressed positive attitudes to almost all questions regarding the LMS system used (GUNet E-Class), the cognitive tool used (Mathematica) and the online discovery/costructivistic learning approach using electronic worksheets. The total of students had positive attitudes regarding whether they would choose to attend another course with asynchronous communication (communication not at real-time), another course with online synchronous communication (real-time communication) and another course using cognitive tools with similar functions.

Answers were equally distributed:

- between positive and negative attitudes, slightly towards positive attitudes, only to the question whether the students can use the LMS system independently of the online presence of the teacher,
- between positive and neutral attitudes only to the question regarding the help browser of the cognitive tool,
- between positive and negative attitudes (with equal percentages) regarding whether they believe that online learning with synchronous communication substitutes sufficiently classroom instruction.

3.2 Inferential statistics

In the inferential analysis similarities and differences between groups of students were investigated, in particular the students were grouped according to gender and experience in the use of computers. Since the variables-questions of the questionnaire are not normally distributed, we used appropriate non parametric tests (Korres, 2015). We used non parametric criteria in combination with Contingency tables, in particular we used the Mann–Whitney test at the grouping according to gender and the Kruskal–Wallis test at the grouping according to experience in the use of computers.

Boys and girls' groups do not differ in their opinion on whether the platform functions are easy to use. On the contrary, they differ in terms of whether they can handle the platform independently of the synchronous (on-line) communication with the teacher: all the girls answered negatively, while the boys answered positively at a percentage of 80%.

The groups of students depending on their experience in using computers do not show differences about whether they can operate the platform independently of the synchronous (on-line) communication with the teacher. On the contrary, they differ in terms of whether the platform's functions are easy to operate: the group with more experience in using computers shows totally positive answers, compared to 45.5% of the group with 1 – 3 years of experience.

Boys and girls' groups do not differ in terms of whether the software has a simple formalism and whether it is generalizable. On the contrary, they differ in terms of:

- whether the software has a dynamic formalism, where the girls show totally positive answers, while 33.3% of the boys show totally positive answers and
- whether the students can operate it without the synchronous communication (on –line) with the teacher, where all the boys answered positively, while all the girls answered negatively.

We cannot draw safe conclusions about the questions:

- whether the software is easy to use, although it appears that boys show a higher percentage of positive attitudes and a large percentage of totally positive attitudes
- whether the software is easy to learn, where girls do not take a position and the percentages in positive responses differ with boys showing a percentage of 53.3% in totally positive responses and girls zero percentage.

The groups of students according to their experience in using a computer do not differ in their opinions about whether the software is easy to operate and whether they can operate it without the synchronous (on-line) communication with the teacher.

On the contrary, they differ on whether the software is generalizable, where the group with more than 3 years of experience shows a positive opinion as a whole, in contrast to the group with 1 – 3 years, which does not take a position by a percentage of 72.7%, while the rest 27.3% shows a negative opinion.

We cannot draw safe conclusions about the questions:

- whether the software is easy to learn, where the group with more than 3 years of experience shows a higher percentage of positive attitudes than the group with 1 – 3 years,
- whether it has a simple formalism, where the two groups have comparable percentages of positive attitudes, but with different distributions of answers and
- whether it has a dynamic formalism, where the group with more than 3 years of experience shows a positive opinion as a whole, while the group with 1 – 3 years expresses positive attitudes at a percentage of 54 .5%, while the remaining 45.5% does not take a position.

Boys and girls groups do not differ in their views on:

- whether the teaching approach provokes students' interest for the lesson,
- whether it supports self-action, experimentation, the creation of personal representations, formulation and checking of conjectures, and
- whether it offers possibilities for students to discuss with each other.

We cannot draw safe conclusions about the questions:

- whether the approach provokes students' interest for Mathematics as a subject, where all girls gave totally positive answers, compared to 46.7 % of boys,
- whether it allows active participation, where all girls gave totally positive answers, compared to 53.3 % of boys,
- whether it allows reflection, where all girls gave totally positive answers, compared to 46.7 % of boys, and
- whether it gives the opportunity for discussion between the teacher and the students, where all the girls gave totally positive answers, while 73.3% of the boys gave totally positive answers, with 26.7% not taking a position.

The groups of students according to their experience in using computers do not differ in their attitudes towards:

- whether the teaching approach supports the creation of personal representations, the formulation and checking of conjectures, and
- whether it offers the possibility for discussion between students-teacher and between students.

On the contrary, they differ as to whether the approach provokes their interest in mathematics as a subject, where the entire group with more than 3 years of experience gave completely positive answers, compared to 27.3 % of the group with 1 – 3 years.

We cannot draw safe conclusions about the questions:

- whether the approach provokes students' interest in the lesson, where although all students expressed positive attitudes, the group with more than 3 years gave a higher percentage of totally positive answers than the group with 1 – 3 years of experience,
- whether it supports active participation, where the distributions of responses of positive views differ,
- whether it allows self-action, where the two groups had comparable percentages of positive attitudes, but the group with more experience shows a higher percentage in the totally positive answers,
- whether it allows experimentation, where although all the students expressed positive attitudes, the group with more than 3 years gave a higher percentage of totally positive answers, than the group with 1-3 years of experience and
- whether it supports reflection, where the group with more than 3 years of experience expressed a positive view overall, compared to 72.7% of the group with 1 – 3 years.

3.3 Multiple Correspondence Analysis

In Table 1, the variables selected for the application of Multiple Correspondence Analysis are presented, corresponding to the questions asked by the questionnaire.

Table 1. Main variables/questions of the questionnaire

N	Variable	Values	Labels
1	Gender	1, 2	Boy, Girl
2	Experience in computers' use	1, 2, 3	Less than 1 year, 1-3 years, More than 3 years
3	Interest in computers' use	1 – 7	Disagree – Agree
4	LMS / Functions easy to operate	1 – 7	Disagree – Agree
5	LMS / Operation independently of the synchronous communication with the teacher	1, 2	Yes, No
6	Software / easy to operate	1 – 7	Disagree – Agree
7	Software / easy to learn	1 – 7	Disagree – Agree
8	Software / simple formalism	1 – 7	Disagree – Agree
9	Software / dynamic formalism	1 – 7	Disagree – Agree
10	Software / generalizable	1 – 7	Disagree – Agree
11	Software / Operation independently of the synchronous communication with the teacher	1, 2	Yes, No
12	Interest for the lesson	1 – 7	Disagree – Agree
13	Interest for Mathematics as a subject	1 – 7	Disagree – Agree
14	Active participation	1 – 7	Disagree – Agree
15	Selfaction	1 – 7	Disagree – Agree
16	Experimentation	1 – 7	Disagree – Agree
17	Reflection	1 – 7	Disagree – Agree
18	Personal representations	1 – 7	Disagree – Agree
19	Formulation and checking of	1 – 7	Disagree – Agree

	conjectures		
20	Discussion between students and the teacher	1 – 7	Disagree – Agree
21	Discussion between students	1 – 7	Disagree – Agree

The number of variables selected is 21 and the number of observations is 21. The number of categories is 128 (number of possible answers). The number of variables without missing values is 19 (= 21 − 2). The maximum number of dimensions is 20, that is the smaller of 128 − 19 = 109 and 21 − 1 = 20. The original data array was 21 x 21. The logical description array is 21 x 128. Burt's array is 128 x 128.

We ran the model in SPSS for the maximum number of dimensions (20), resulting in a total inertia of 2.621. We chose three dimensions (complex variables), which explain a total inertia of 1.572; that is 59.98% of the total inertia. We must note that when applying Multiple Correspondence Analysis, the selection of dimensions explaining a percentage of the total inertia greater than 30% is acceptable.

In Table 2 the eigenvalues and percentages of inertia are presented in detail.

Table 2. Eigenvalues and percentages of inertia per complex variable/dimension

Complex variable/ Dimension	Eigenvalue– Inertia	Percentage regarding the total inertia	Cummulative percentage	Percentage regarding the 3 dimensions
1st	0.593	22.62 %	22.62 %	37.72 %
2nd	0.519	19.80 %	42.42 %	33.02 %
3rd	0.460	17.56 %	59.98 %	29.26 %
Total:	1.572	59.98 %		100.00 %

In order to see which variables contribute more to the formation of each of the three dimensions, we calculated the contributions of each variable to the construction of each dimension via Excel (percentage of the inertia of the points along an axis to the total inertia of the axis).

Table 3. Contributions of variables per complex variable/dimension

	1st dimension	2nd dimension	3rd dimension
Gender	7.21 %	0.00 %	0.24 %
Experience in computers' use	0.01 %	0.14 %	9.20 %
Interest in computers' use	7.21 %	4.86 %	2.23 %
LMS / Functions easy to operate	5.24 %	4.33 %	4.83 %
LMS / Operation independently of the synchronous communication with the teacher	5.64 %	0.08 %	1.20 %
Software / easy to operate	4.93 %	6.33 %	9.41 %
Software / easy to learn	6.26 %	7.05 %	1.26 %
Software / simple formalism	2.59 %	5.44 %	5.64 %
Software / dynamic formalism	7.37 %	4.12 %	3.10 %
Software / generalizable	7.29 %	3.28 %	9.41 %
Software / Operation independently of the synchronous communication with the teacher	6.98 %	0.60 %	0.25 %
Interest for the lesson	0.88 %	6.06 %	1.76 %
Interest for Mathematics as a subject	2.13 %	6.43 %	6.51 %

Active participation	3.46 %	6.47 %	8.68 %
Self-action	5.97 %	6.82 %	4.90 %
Experimentation	3.91 %	8.60 %	4.88 %
Reflection	3.20 %	2.31 %	4.27 %
Personal representations	6.22 %	7.47 %	5.42 %
Formulation and checking of conjectures	7.64 %	8.28 %	7.97 %
Discussion between students and the teacher	2.47 %	5.10 %	3.92 %
Discussion between students	3.38 %	6.25 %	4.95 %
Total:	100.00 %	100.00 %	100.00 %

Four homogeneous groups of variables occurred by studying the scatter plots of each dimension with one another, graphed via SPSS:

1. The first group includes the variables related to whether the software is easy to operate and easy to learn and the variables related to the teaching approach: formulating and checking conjectures, creating personal representations and self-action. The correlation is expected, since the students who found the software easy to operate and easy to learn, are expected to have more freedom to act independently, to formulate and check conjectures and, by extension, to create personal representations.

2. The second group includes the variables of students' interest in using computers and whether the software has a dynamic formalism and is generalizable. One interpretation could be that students' opinions about the software's didactic possibilities and extensions depend on the students' interest in computers' use.

3. The third group includes the variables about whether the students can handle the platform and the software independently of the teacher and gender.

4. The fourth group includes the variables related to whether the teaching approach provokes the students' interest for the lesson and the subject, whether it supports students to participate actively, to discuss with each other and with the teacher and whether the software has a simple formalism. One interpretation could be that the possibility of discussion in the course between students and between students and teachers is related to their active participation. Also, the provocation of students' interest for the lesson and the academic subject depends on the possibility of discussion in the course and the active participation of the students.

We also observed that the variable experience of students in using computers falls on the intersection of the axes, which means that students differ in their responses to the categories of this variable (Less than 1 year, 1 – 3 years, More than 3 years). This result also emerged in the Inferential analysis.

3.4 Cluster Analysis

Cluster Analysis allows us to identify homogeneous groups of individuals in terms of the set of main variables. We applied Automatic Classification to the data set that has been produced by Multiple Correspondence Analysis, assigning to each main variable three coordinates, one for each dimension (complex variable). The dimensions in this way are reduced from 128 to 3. The main result of the Automatic Classification technique is presented with a dendrogram.

We implemented the method via SPSS, producing a set of classifications from 2 to 12 groups. From the results of the analysis, we chose the classification into 6 groups, since for a smaller number one of the groups each time had a disproportionately large number of students.

The automatic classification of the 21 students into 6 groups is presented via a dendrogram and is shown in Figure 1.
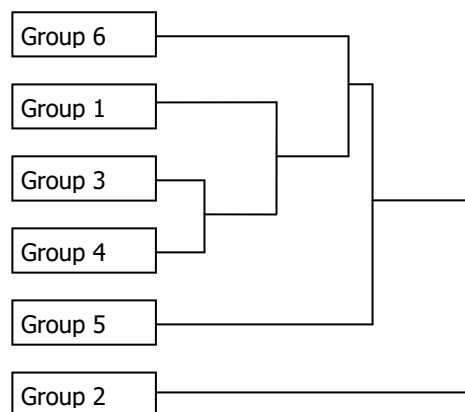
Figure 1: Groups of students by Cluster Analysis

Table 4 is a description table for the 6 homogeneous groups of students resulting from the application of Automatic Classification (Cluster Analysis). The students' answers to the main variables-questions of the questionnaire were characterized as follows: a) Positive Attitude: answers 5 - 7, b) Negative Attitude: answers 1 - 3 and c) Neutral attitude: answer 4.

Table 4. Description table of students' groups

Variable	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Number of std. / Percentage %	2 / 9.5 %	2 / 9.5 %	5 / 23.8 %	6 / 28.6 %	3 / 14.3 %	3 / 14.3 %
Gender	Boys	Boys	Boys	Boys	Girls	Girls
Experience in computers' use	> 3 years	1 − 3 years	> 3 years	1 − 3 years	> 3 years	1 − 3 years
Interest in computers' use	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude
LMS / Functions easy to operate	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude
LMS / Operation independently of synchronous communication with the teacher	Yes	Yes	40% Yes 60% No	Yes	No	No
Software / easy to operate	Possitive attitude	Negative attitude	Possitive attitude	Possitive attitude	Possitive attitude	Neutral attitude
Software / easy to learn	Neutral attitude	Possitive attitude	Possitive attitude	50% N Att 50% P Att	Possitive attitude	Negative attitude
Software / simple formalism	Neutral attitude	Negative attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude

Software / dynamic formalism	Possitive attitude	Neutral attitude	Possitive attitude	50% N Att 50% P Att	Possitive attitude	Possitive attitude
Software / generalizable	Possitive attitude	Neutral attitude	Possitive attitude	Neutral attitude	Positive attitude	Negative attitude
Software / Operation independently of synchronous communication with the teacher	Yes	–	Yes	Yes	No	No
Interest for the lesson	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude
Interest for Mathematics	Possitive attitude	Possitive attitude	Possitive attitude	50% N Att 50% P Att	Possitive attitude	Possitive attitude
Active participation	Neutral attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude
Selfaction	Neutral attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Negative attitude
Experimentation	Possitive attitude	Possitive attitude	Possitive attitude	50% N Att 50% P Att	Possitive attitude	Neutral attitude
Reflection	Possitive attitude	Possitive attitude	Possitive attitude	50% N Att 50% P Att	Possitive attitude	Possitive attitude
Personal representations	Negative attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Neutral attitude
Formulation and checking of conjectures	Negative attitude	Possitive attitude	Possitive attitude	Possitive attitude	Possitive attitude	Negative attitude
Discussion between students and the teacher	Neutral attitude	Possitive attitude	40% N Att 60% P Att	Possitive attitude	Possitive attitude	Possitive attitude
Discussion between students	Neutral attitude	Possitive attitude	40% N Att 60% P Att	Possitive attitude	–	Possitive attitude

Below we present the main similarities and differences of the groups, taking into account the dendrogram obtained from the Automatic Classification and the results of the Multiple Correspondence Analysis.

Groups 3 and 4, which include 52.4 % of the sample, show the same positive attitudes on all questions except the questions:

- on operating the platform independently of the teacher's online presence (Group 3: 60 % No, Group 4: 100 % Yes),
- whether the software is easy to learn and has a dynamic formalism (Group 3: 100 % Positive attitudes, Group 4: 50 % Positive attitudes),
- whether the approach provokes students' interest for the subject, supports experimentation and reflection (Group 3: 100 % Positive attitudes, Group 4: 50 % Positive attitudes) and
- whether the approach supports discussion between students-teacher and between students (Group 3: 60 % Positive attitudes, Group 4: 100 % Positive attitudes).

Group 1, which corresponds to 9.5% of the sample, shows positive attitudes on all questions except the questions:

- whether the approach supports the creation of personal representations and the formulation and checking of conjectures (Negative attitudes),
- whether the software is easy to learn and has a simple formalism (Neutral attitudes) and
- whether the approach supports active participation, self-action, discussion between students-teacher and between students (Neutral attitudes).

Group 6, which corresponds to 14.3% of the sample, shows positive attitudes on all questions except the questions:

- whether the software is easy to learn and is generalizable (Negative attitudes),
- whether the approach supports self-action and the formulation and testing of conjectures (Negative attitudes),
- whether the software is easy to operate (Neutral attitudes) and
- whether the approach supports experimentation and the creation of personal representations (Neutral attitudes).

The main differences between Group 6 and the previous groups 3, 4 and 1, are that it consists of Girls and that the group's students state that they cannot operate the platform or the software independently of the synchronous communication with the teacher.

Group 5 corresponds to 14.3% of the sample and consists, like Group 6, of Girls who stated that they cannot operate the platform or the software independently of the synchronous communication with the teacher. Group 5 shows in all the remaining questions positive attitudes. Group 5 shows more experience in using computers than Group 6, which may justify their positive views on more subjects.

Finally, Group 2, which corresponds to 9.5% of the sample, shows:

- positive attitudes to all the questions regarding the teaching approach,
- negative attitudes to the questions about whether the software is easy to operate and whether it has simple formalism,
- neutral attitudes to the questions about whether the software has a dynamic formalism and whether it is generalizable.

4. Conclusions

This paper studies the environment of online discovery learning/constructivistic approach using cognitive tools, in Mathematics' higher education. A study is presented, which was realized at the Department of Statistics and Insurance Sciences of the University of Piraeus, concerning the identification of complex variables (dimensions) and groups of students regarding the students' attitudes towards the characteristics of the LMS system used, the cognitive tool used (Mathematica) and the online approach regarding discovery/constructivistic learning. Also the paper presents a combination of multivariable methods, in particular Multiple Correspondence Analysis and Cluster Analysis, in order to come up to a set of groups of students with differentiated characteristics, each group corresponding to different attitudes. These results were associated with inferential analysis results.

The comparative study of the multivariable analysis' results and inferential statistics' results provides the following results:

1. A relationship that is verified is the relationship between gender and the ability to operate the platform and software independently of the synchronous communication with the teacher, which also emerged from the Inferential analysis: Girls showed negative responses, while boys showed positive responses overall.

2. A second relationship that emerges is the relationship between experience in using computers and positive attitudes towards the features of the software and the teaching approach. More computer experience means positive attitudes on more questions.

3. The hypothesis is verified that groups who found the software easy to use and easy to learn also had a positive view of whether the approach allowed them to act independently, formulate and check conjectures, and create personal representations, as opposed to groups that had a negative view or expressed neutral attitudes.

4. It is verified that groups with a positive view of the possibility of students discussing with the teacher and with each other also had a positive view about active participation. The hypothesis regarding the relationship of the attitudes regarding the above characteristics and the provocation of interest for the lesson and the subject cannot be tested, since all groups (except the fourth for the subject) expressed positive attitudes regarding their interest as a whole.

5. The hypothesis about the relationship between interest in computer's use and whether the software is generalizable and whether it has a dynamic formalism cannot be tested, since all groups expressed positive attitudes about their interest in computers' use as a whole.

We propose the combination of multivariable analysis methods in association with inferential analysis techniques, as they can provide useful tools in understanding and "charting" the complex interactions between variables-characteristics of a teaching-learning environment. Multiple Correspondence Analysis or Factor Analysis can group variables into complex ones. The combination of these methods with Cluster Analysis can provide groups of students with similar characteristics. The results obtained by such an analysis, can be used in providing individualized support to certain groups of students, also in making decisions regarding instructional design in a specific educational environment.

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New educational and technological methodologies for digital museum tours in the COVID-19 era. The VISITOR project

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Abstract

Training curricula must be led by strategies to reinforce learners' skills and engagement in different ways to adjust the particularity of any school content. Towards this end, technology-assisted learning can provide valuable assistance in terms of tools and appropriate educational methodologies. This need is highlighted in emergencies like the recent Covid-19 pandemic, which has caused the closure of many schools globally, posing a stress test to the education system and its smooth continuity, turning the focus on distance teaching and virtual classroom methodologies. To achieve this, teachers should be trained and provided with digital learning opportunities to use digital training resources effectively to create educational scenarios. Following the above priority, five European organizations from France, Greece, the United Kingdom, and Belgium decided to design and implement the project "Virtual Museums In The Covid era" (Visitor), a European collective project funded under the framework of the Erasmus+ program. VISITOR project promotes innovative methods and digital tools. Specifically, it supports teachers in developing digital competencies and safeguarding the inclusive nature of learning opportunities. For this purpose, a creative e-training course for teachers grounded on a Problem Based Learning (PBL) process designed with innovative pedagogical strategies (e.g. the digital

storytelling process, lesson plans and citizen science), a content aggregator of digital museum exhibits and a digital application for virtual tours are adopted.

This paper presents the structure of the Visitor project, highlights the methodology followed to establish the appropriate educational tools and explains the pedagogical dimension formed based on the results of a quantitative and quantitative need analysis research. The qualitative study was conducted to identify the academic and technological skills and knowledge that might be lacking to establish an initial framework with the appropriate educational tools and technics to structure the e-training course profile. The second study identified teachers' previous experience, motivation, activity settings and challenges to increase the pedagogical effectiveness of the selected VISITOR's pedagogical tools according to the new training needs established by the pandemic.

The study highlighted the significance of designing an e-learning training course based on needs analysis processes in light of the evidence. Furthermore, this paper can be used as a methodological framework for a comprehensive approach to design and implement an effective e-training strategy grounded on the needs of the educational, technological and social conjunctures (e.g. the problem of the pandemic).

Keywords: digital skills, inclusive education, new digital pedagogies, text-based game, virtual museums

1. Introduction

The concept of learning is directly related to the permanent change in the individual's behaviour, which is the result of experience and practice. Learning is a purely personal process with an individual character and is not only completed through a specific educational system. It is a continuous process that takes place throughout life and uses various ways and means. This constant process of acquiring knowledge and skills is the most distinguishing feature of the human species. However, multiple types of learning can be identified by how to organize the curriculum content and the teacher's degree of intrusiveness (Ryan & Bowman, 2022).

The European Commission has defined lifelong learning as the set of activities throughout life in the context of a perspective that concerns the individual himself, society, citizenship or employment (Brine, 2006). From an educational viewpoint, the didactic utilization of museum collections can be a breeding ground for lifelong learning. In the modern museum of the 21st century, the appropriate landscape for achieving a multitude of educational goals formed, such as the development of the student's critical thinking, who, by coming into contact with the objects, formulates assumptions and reflections that sharpen the mind and cultivate the thought. Fertile ground is formed, therefore, for the collaboration of the museum with the school, which is the primary body of transmission of formal knowledge, so that the final recipient, who is none other than the student, benefits and establishes a non-formal learning relationship, which perceives knowledge not as a product of coercion, but of search source.

From the United States of America to the European Union and as far as Singapore, educators and policymakers are talking explicitly about 'twenty-first-century skills and competencies as the tools for the 'twenty-first-century citizen': a confident person who has a sense of right and wrong, is adaptable and resilient, knows themself, thinks independently and critically, and communicates effectively (Pellegrino & Hilton, 2012). Meeting the goal for the new skills and competencies means investing in a new approach to school and lifelong education, which promotes skills such as 'critical and systems thinking, information literacy, creativity, adaptability, conscientiousness, persistence, global awareness, self-regulation, cultivation of interests, the building of social capital, positive orientation to academic subjects. This calls for individualized, self-directed approaches in which learners 'collaborate with educators and with experts in their communities and around

the world to customize rigorous learning experiences based on competency and interest instead of time and age (Alt & Raichel, 2022).

Consequently, the term "educational" program for museums is not one-dimensional as it does not concern a single method or group of visitors but is characterized by methodological variety, such as narration, guided tour or storytelling, discussion with the application of the obstetric process, or even exploration of the museum space and addressed to separate target age groups, to keep the interest of the participants undiminished, but also to respond differently to the particularities of the visitors, through its particular characteristics of each method.

When developing an educational program, the main concern is the achievement of general and specific individual goals that derive from the same themes of these programs. The general objective could be to introduce visitors to local history through finds and objects or to raise students' awareness of cultural heritage and the importance of its protection. However, the pedagogical goal-setting, such as cooperation, an active approach to the material through the senses and experiential learning, could not be omitted. It is noteworthy, according to the International Council of Museums, that the primary motivation for the implementation of the educational programs is "to achieve the combination of knowledge acquisition and entertainment, to create inspiration and attract the interest of the public and finally to shape observation skills and develop of interest regarding historical events, to shape cultural consciousness. (Yun, 2022).

Digital technologies have radically changed the way we perceive museum education. More specifically, augmented and virtual reality applications give the museum a "digital presence" and create a new ecosystem for museums and museum education. Either with the use of augmented reality applications, where digital content is projected onto the natural one-user environment through appropriate media, such as text, information and graphics, 3D graphics or video, or by applying virtual reality systems, which differ from the previous ones in that they transport the user to a different world, where they can still they have the feeling of flying, while their feet are on the ground, the museum experience is enriched, thus contributing to learning. Digital technologies have radically changed the way we perceive museum education.

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This new enriched experience follows a specific path that begins with an impulse of internal or external motivation, with pure goals and rules that create an authentic interest in the user, who experiences it as a state of "flow". The "flow" is related to the positive state of mind, in which the person is entirely focused on what he is doing, loses the feeling of time, does not feel tired and, above all, is entertained by the activity. Thus, by extension, learning takes place. To maintain the flow and not lose o visitor's interest and still wants to participate, their engagement with the exhibit (e.g. a digital touch screen) should have ever-increasing levels of difficulty, which the visitor should face by making more use of his skills (Csikszentmihalyi & Hermanson, 1995).

Another application in the hands of technology is digital storytelling. When made interactive, it acquires even more significant meaning as it involves the subject in the learning process, inviting it to create its personal stories and incorporate its interpretations and perspectives (Wyman et. al. 2011). The latest years, digital games, digital stories or constructions with the help of digital media are also introduced.

Beyond, however, the degree to which digital tools contribute or not to the learning process, what the inclusion of digital technologies in cultural spaces primarily achieves is the concept of participation in the shaping of cultural experience, in the light of active mediation and co-creation, through group activities that allow participants to act simultaneously as creators, distributors, consumers and critics of content, while at the same time being able to collaborate - connect.

2. Background

The Covid-19 has signaled the closure of many schools globally posing a stress test to the education system and its smooth continuity. As the personal development of the human capital is at stake, the problem should urgently be addressed. While confronting the second wave of the pandemic, national Governments put a lot of effort so that the schools will be able to deliver the curricula even in the event of a second lockdown (Viner, et al, 2022).

As the situation is urgent and there is no precedent for that, not all needs can be simultaneously addressed and with success. The project aims to deal with the prohibition of cultural visits to museums and other exhibition areas in the Covid- 19 era, even now that the schools are open and proposes its digital integration in the school curricula. Outdoor cultural activities definitely support not only school education in the field of history, technology or science in general but also the personal development and the emotional state of the students

In this vein, five European organizations from France, Greece, the United Kingdom, and Belgium designed to implement the project "Virtual Museums In The Covid Era" (VISITOR), a European-funded collective project under the framework of the Erasmus+ program. VISITOR aims to be a solution for visits to museums virtually, united European culture, and fostering intercultural awareness and conscience through a virtual and inclusive educational process.

The first crucial step for the VISITOR's research team was to define a practical pedagogical framework for designing, developing and evaluating the Visitor's digital deliverable tools and activities that will develop. For this purpose, the Hellenic Open University (HOU) and the Open University (OU) of the United Kingdom implemented two need analysis research, a qualitative and a quantitative one. The quantitative research, which leader organization is HOU, focused on defining Greek teachers' skills in inclusive pedagogies and approaches they use and their opinion on using technologies as supporters of inclusive education. The quantitative research, which leader was OU, focused on exploring teachers' views on the use of virtual museum tours in their classrooms. The first research guided the VISITOR team to define the pedagogical context of the VISITOR Project. The second one investigated which knowledge the teachers already have in virtual museum environments. Based on these results, the VISITOR team defined the learning content the Visitor project must deliver to teachers.

By Gould, Kelly, White & Chidgey (2004), training need analysis is the primary initial step in a cyclical process, contributing to the definition of the overall educational strategies that must be followed. Zagora, Kurth & MacFarland (2017) claimed that the need analysis could highlight and investigate teachers' preparedness for

inclusive education, including their skills and knowledge in digital literacy. Need analysis is crucial to define the pedagogical methodologies in a training process for digital inclusion.

3. The Hellenic Open University Qualitative Study

The the study brought to the light evidence for two basic thematic areas. The data higligted that the teachers face obstacles in applying inclusive pedagogical practices and planning procedures. Furthermore the teachers have available ICT competencies that can be expanded.

The study highlighted misconceptions in teaching methods issues related to the need for systematic training of teachers in inclusive digital education higtlighed. To address these barriers, Visitor designed based on a structure educational framework to adrees on thsese specific needs. The Visitor decided to involve the use of informal learning environments by teachers, such as digital museums and digital applications (Kouvara et al. 2022).

4. The Open University Quantitative Study

The study aims to understand the experiences and expectations of teachers who have joined or plan to join Virtual Museum Tools in their classrooms. Findings from this study indicate teachers' motivations and challenges when engaging in VMTs and their expected or desirable support. Teachers' motivations in joining VMTs with their classrooms were associated with their desire to increase students' interests in museums and use novel teaching methods in their classrooms. Both types have been encountered in previous research studying teachers' motivations with VLE.

According to Aristeidou et al. (2022), teachers' motivations for joining VMTs were mostly to increase students' interest in museums and use novel teaching methods in their classrooms. On the other hand, the main challenges teachers mentioned were designing activities around the visit, finding time and devices to organize the visit, and aligning it with the curriculum aims.

To address these challenges in the context of the project artefacts and exhibits in the VMT can be accompanied by use cases of different levels. In addition, the introduction of group activities with relevant learning material could help the lack of devices.

While students' engagement is the primary motivation for teachers, they are still concerned with designing VMT learning activities that target specific curricular objectives and learning outcomes.

5. The Visitor Project

The combination of the research results with those published in the literature recently brings to the surface the educational framework followed by the teachers regarding inclusivity and their teachers' ICT competencies in the field of the virtual learning environment. Thus,

The VISITOR project introduces an e-learning training course for teachers based on the PBL method. The teachers have to implement virtual tours gathering educational materials through the content of digital museums.

The e-learning training course includes various ICT tools activities, such as digital storytelling, text-based games, and citizen science. Teachers have to:

- Define their stories' topic through learning techniques such as brainstorming and critical thinking, using videos and portfolios of gathered material and synthesizing information.

- Gather digitally available material from museums
- Plan the map of their story via brainstorming, quick comparative writing, drafting, redrafting, rearranging content and, ultimately, peer evaluation
- Pick the technological equipment they will use for the digital story production through a proposed list.
- Assess their projects according to a Rubric assessment.

Additionally, VISITOR aims to deliver:

- A content aggregator of digital museum exhibits toolkit. The specific element will facilitate teachers to search, locate and retrieve digital materials from museums
- A digital application for virtual tours. A text-based game will lead the trainer in a virtual 3D futuristic exhibition. It will allow learners to earn knowledge in culture, history, arts and science. Specifically, the specific tool will enable teachers to design their interactive quizzes into different modules, each corresponding to various thematic aspects
- Exemplar use cases for digital exhibits and citizen science resources. Exemplar use cases of the museum digital exhibits will involve the presentation of lesson plans, or practices that build towards the creation of an effective lesson plan, such as the concept or objective to be taught, the time duration, procedures and processes, the required museum exhibits, questions to be asked, and the evaluation of the lesson. Teachers can use the exemplar use cases as models to facilitate them in achieving curriculum goals or structuring extracurricular activities.

6. Conclusions

The needs analysis methodology highlighted the gaps that an educational design must cover, considering the school and time context. In particular, through the qualitative and quantitative data brought to the surface by the two surveys, the visitor project combines technology and modern digital environments with the educational process, aiming through the art tour to create a pleasant and flexible environment that adapts to the needs every student.

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New ways of teaching and learning. Twenty years of experience with lifelong learning courses at the UNED.

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Abstract

Lifelong Learning (LLL) is supported by UNED by the Continuing Education Programs, and basically in two main programs: The POSTGRADUATE PROGRAM, aimed at people with a university degree who wish to update their knowledge or achieve a specialization in some area; and the PROFESSIONAL AND PERSONAL DEVELOPMENT PROGRAM is aimed at people who seek, without the need for a university degree, a professional improvement or update or to be trained for cultural or academic interests. They are courses that respond to the demands and interests of the employment world.

UNED also has additional Postgraduate Programs and Professional and Personal Development with a modular structure. They are flexible courses with an open and progressive training. They are open because the student is the one who selects the itinerary that will follow according to their training interests within the framework programmed by the teaching teams. The second characteristic is that they are progressive, because the training allows the students accreditation by modules and to access higher level degrees.

The courses taught in the Continuing Education Programs are accredited by issuing Titles of the National University of Distance Education, following our Regulations on Continuing Education Studies guidelines. They are training courses preferably online, although there are also blended, and even, exceptionally, some are face-to-face. Its duration usually coincides with the academic year from December to May. However, the information for each course includes the beginning and end of each of them explicitly.

The main areas of knowledge within which the course offer is framed are Sciences, Engineering and Architecture, Legal Sciences and Public Administration, Social Sciences, Labour Relations, and Cooperation, Economics and Business Management, Education, Humanities and Arts, Informatics, Languages, Psychology, Health, and Security and Defence. Our paper studies what kind of courses students have chosen from 2008 to 2022.

Keywords: LIFELONG LEARNING, UNED, PROFESSIONAL PROGRAMS.

1. Introduction

During the past decades, there have been significant shifts in adult education and lifelong learning. In the past lifelong learning (LLL) was seen as a personal good and an inherent aspect of life, but today LLL is increasingly understood in terms of human capital and investment in economic development to reach competitiveness and economic growth (OECD, 1997). Furthermore, OECD has also emphasized the economic rationale for LLL, understood as learning "throughout life." In this sense, in the past, the field of lifelong learning was predominantly informed by a social purpose, but now it seems that the current emphasis is on "learning for earning," where adult learning is considered a way for economic growth and global competitiveness.

We can find some of the causes of this change in a globalized economy that requires individuals to develop new knowledge and updated skills throughout their adult lives to cope with modern life, both in work and in their private lives (Marjan, 2012). Under this perspective, European Commission considers Lifelong learning as all learning activity undertaken through life to improve knowledge, skills, and competencies within a personal, civic, social, and employment-related perspective (Herrero, 2012)

This shift towards a "learning economy" has resulted in a much more individualistic understanding of lifelong learning, transforming it from an individual right associated with the state's duty that provides resources and opportunities for individuals to enroll in learning; into a duty where lifelong learning is an issue and responsibility that individuals must take care off (Grace, 2004; Fejes, 2004).

This change is visible not only at the political level but also at a personal level. For example, at the political level, states could provide formal education access for all individuals and ensure the transparency and competence guaranteed by a common framework that will serve as a tool to compare the qualifications and their levels in different higher education organizations. Furthermore, at the individual level, learning opportunities for adults could be selected on their own, depending on the individual valuable learning that allows the adaption and renewal of knowledge and skills necessary to face changes in a global economy.

This assumption leads to an important issue about the motivation for learning. Adults will engage in lifelong learning if they can select the content, the purpose, and the direction of their learning. In this sense, Lifelong learning involves all strategies to create opportunities for people to learn throughout life. It is about learning what, how, where, and when the individual wants to learn.

Observing this complexity in the model Aspin & Chapman (2001) proposed is possible. They argued that lifelong learning follows three different purposes: (1) lifelong learning for economic progress and development. Let us think of lifelong learning as the learning that continues throughout life after the initial phase of formal Education. The acquisition of new skills and knowledge related to work is essential for the adult's employability, economic progress, and the economy. (2) Lifelong learning for personal development. Developing one's potential and talents and learning from encounters and experiences. And (3) Lifelong learning for social inclusiveness and democratic understanding and activity, with the empowerment and emancipation of individuals. In this sense, European Commission argues that lifelong learning is not only about employment and adaptability but also a means to personal fulfillment, active citizenship, and social inclusion.

This lifelong learning model helps us see how the relationship between the purposes leads to different configurations of lifelong learning. Individual motivation is a complex phenomenon that develops and changes over time. The use of the term learning, which replaces the concept of Education used by earlier generations (Lindeman, 1926), shows this increase in individualization in lifelong learning. Education refers to the interaction between an educator and a student, while learning denotes something that one individual can do alone (Biesta, 2005) and can take different forms from the traditional learning classroom environment.

2. Analysis scope

The National Distance Education University, known in Spanish as Universidad Nacional de Educación a Distancia (UNED), is a national public research university founded in 1972 under the Ministry of Universities. It has headquarters in Madrid, Spain, with campuses in all Spanish autonomous communities. In addition, there are 14 study centers and three exam points in 13 countries in Europe, the Americas, and Africa. The University awards undergraduate and postgraduate degrees, non-degree qualifications such as diplomas and certificates, or continuing education units.

Focused on distance learning combined with traditional classroom instruction (called hybrid or blended), with over 150.000 students, UNED is the largest University in Spain and the second largest in Europe. UNED has a complete offer of official studies complemented by a varied proposal of its degrees. The offer of official studies is composed by:

- Degrees
- Combined undergraduate degrees
- EHEA Master's degrees
- EHEA doctoral studies
- Languages

The UNED's Ongoing Formation or lifelong learning consists of two main programs: The postgraduate program aimed at people with a university degree who wish to update their knowledge or achieve a specialization in some area, and the professional and personal development program for people seeking professional improvement, updates, or training for cultural or academic interests.

The studies carried out within the postgraduate program can lead to obtaining a UNED-specific degree, different depending on the number of credits and the degree of depth and category of the degree obtained:

- Master's degree courses
- Specialization Diploma
- Diploma of University Expert
- Teacher Training Certificate

While the studies carried out within the professional and development program can lead to obtaining the following accreditations:

- Diploma of Professional Expert
- Certificate of Open Teaching
- Certificate of Professional Updating

These courses respond to the demands and interests of the world of work. The courses taught in the Continuing Education Programs issue Titles of the National University of Distance Education follow our Regulations on Continuing Education Studies guidelines. Courses designed by department professors and professionals from the world of work allow a better adjustment to the needs of the actual labor world. They are training courses preferably online, although there are also blended, and even, exceptionally, some are face-to-face. Its duration usually coincides with the academic year from December to May. However, the information for each course includes the beginning and end of each of them explicitly. With all these characteristics, adult students can select the most suitable training for their needs. It also allows flexibility for the implementation and proper monitoring of the program.

The main areas of knowledge the course offers are Sciences, Engineering and Architecture, Legal Sciences and Public Administration, Social Sciences, Labour Relations and Cooperation, Economics and Business Management, Education, Humanities and Arts, Informatics, Languages, Psychology, Health, and Security and Defence.

Since 2000 within the Department of Applied Economics and Statistics, one of the groups of professors in the department began to design and teach UNED titles. The period from 2000 to 2008 was one of growth. However, in 2008 there was an essential change in Spain's educational field: adapting Spanish studies to the Bologna process: Introducing a three-cycle higher education system consisting of bachelor's, Master's, and doctoral studies. The Spanish "Licenciatura," previously a five- to six-year cycle, was divided into a four-year program, the bachelor's degree, and a subsequent one-year program that gave access to the Master's degree. As a result, European Higher Education Area (EHEA) master's degrees became competitors for UNED lifelong learning degrees, particularly UNED Master's degrees.

In this presentation, we study the evolution of the students enrolled and graduated in these postgraduate courses from 2008 to 2021, comparing the evolution of students enrolled in EHEA (European Higher Education Area) Master's degrees with those of UNED lifelong learning.

3. Characteristics of studies and Data

The UNED has transformed since 2000, with new forms of teaching and materials in official and lifelong learning training courses. Although digitalization and the introduction of new forms of learning are far from over, it is a fact that the process has begun and reached a reasonable degree of development. Therefore, learning by doing is an essential part of a UNED-specific degree. Perhaps evolution has been faster in lifelong learning in UNED-specific degrees than in EHEA master's degrees, but the difference is insignificant. Table 1 shows the significant differences that determine the two types of studies.

Table 1: EHEA master's degrees vs. UNED specific degrees

Key Aspects	EHEA master's degrees	UNED-specific degrees
Teaching Staff	UNED teachers	UNED teachers and other experts
Access	University degree	University degree for Master's and baccalaureate and vocational training for other courses
Dissertation	Allows access to doctoral studies	It does not allow access to doctoral studies
Official Approval	EHEA	No

Career Opportunities	Depends on the company	Depends on the company
Duration of the studies	Not less than 60 ECTS credits and not more than 120	Not less than 60 ECTS credits for a Master's and 29 for a diploma.
Price	Fixed by the Ministry of Education. Economic.	The teaching staff decides on them. It cannot be less than the EHEA master.
Valuation as merit	Scored as a postgraduate course.	Not usually scored as a postgraduate course. The importance that companies want to give it.

This report was a mixed methods study, using qualitative data, carried out by discussion transcripts with students and professors, and quantitative data collected by academic performance statistics. This process was time-intensive so that we could have a large-scale data analysis.

For the analysis, we consider students enrolled in the different programs as an indicator of their interest in different programs. As shown in Figure 1. the total number of students in lifelong learning has decreased in favor of EAEH master's degrees, although lifelong learning maintains the most significant number of students enrolled. Official recognition, prices, and access to the specialization of official and doctoral courses can determine this growth. However, even this, the total number of students enrolled in the UNED own title masters is greater than the EHEA ones.

Figure 1: Evolution of the number of students enrolled in the two programs
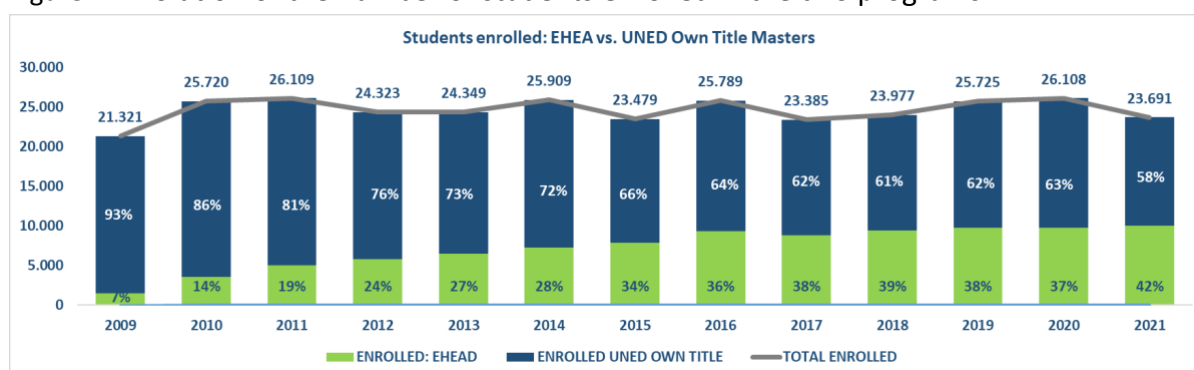
The number of students who graduated from the different programs indicates adult students' interest and motivation. In Figure 2, we can see the more significant number of graduates in lifelong learning compared to the EHEA programs. The curricular design, more adjusted to the labor market, the teaching method, and the evaluation system, indicates a fine adjustment to the learning needs of these students.

Figure 2: Evolution of the number of students who graduated from the two programs
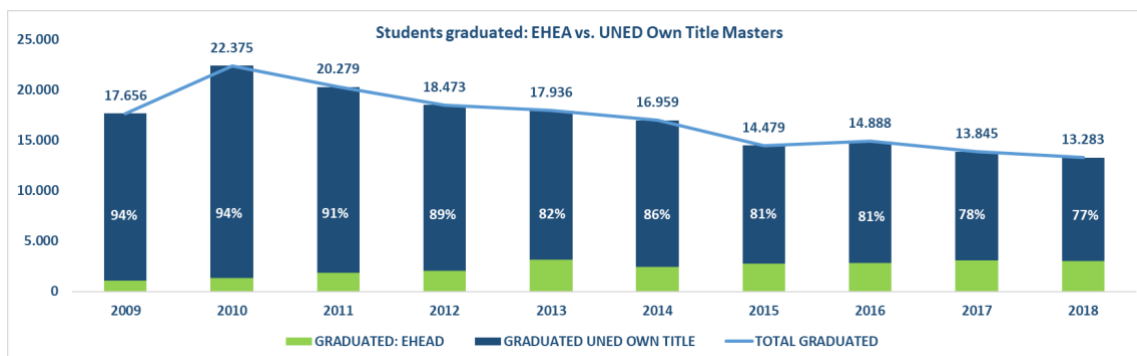
The curricular design, more adjusted to the labor market, the teaching method, and the evaluation system, indicates a fine adjustment to the learning needs of these students that complete the lifelong learning programs with a higher percentage of success than the EHEA programs.

Figure 3: Evolution of graduated students in the two programs
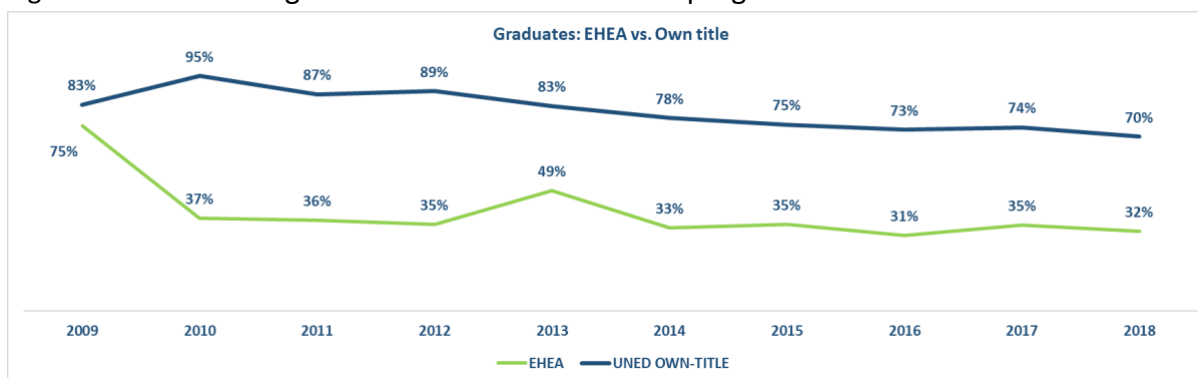
4. Conclusions

We have analyzed the recent transformations in lifelong learning consequences for adult students. The rise of the learning economy has resulted in a situation where individuals must take care and responsibility for their learning, and one of the motivations seems to be adding professional skills in a growing demand for parallel systems adjusted to the labor market.

The evolution of the number of students in the two classes of studies shows:

1. The total number of students in lifelong learning has decreased in favour of EAEH master's degrees.
2. Although lifelong learning maintains the most significant number of students enrolled.
3. The number of graduates is much higher in permanent training than in official master's degrees.

The more significant advantages offered by EAEH master's degrees compared to permanent training in everything that refers to prices, official recognition that also allows access to doctoral courses, determines the growth in the number of students enrolled in that kind of study.

The "Licenciatura" in Spain included three years of diploma and two years of specialization but did not include a master's degree denomination. However, separating the "Licenciatura" into two cycles has included the word master's degree in the degree obtained, and that has undoubtedly influenced the choice of the Master's degree that provides the most advantages from the theoretical point of view that the Ministry of Education has predetermined.

Despite the enormous advantages of official Master's degrees over continuing education courses, the total number of students enrolled in the last class of studies mentioned is greater than the total number of students enrolled in official Master's degrees.

One possible explanation is that the theme, the curricular design, the teaching method, and the evaluation system are more adapted to the needs of the students. In addition, the design of courses by professors and experts outside the University and not by the academic authorities perhaps explains the excellent attractiveness of these courses for students, despite not having the same recognition as an official degree.

The explanation of the most significant number of graduates in the courses of permanent training is obvious, the students of the official Master's degrees are allowed to complete the Master's degree in several academic years, while the students of permanent training are required to finish within the academic year.

The lifelong learning student can carry out the studies for several years, but each year he must pay the total cost, something no student is willing to do unless the circumstances force him. The usual thing is that students who have not passed or have not taken the exams do not try again. The more significant number of graduates in lifelong learning is good for the institution that issues these degrees and demonstrates greater efficiency in using the resources available at the University.

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Online Degree Programme Network Supporting Flexible Online Education

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Abstract

Digitalisation and changes in society have created the need for developing new ways of learning. Disruptions in education are caused by various unexpected situations, such as the lock-down during the recent pandemic. Also working life is changing and remote work is placing new expectations to higher education, where new study modes are necessary to create even more flexible and continuous learning paths. Students are also interested to study online and utilise the more flexible approaches to learning from the pandemic.

Online degree programmes are Higher Education (HE) study programmes that lead to a degree, and where education and support services are offered online the entire duration of the degree. They differ from blended study programmes where some parts of the studies are offered on campus.

The purpose of this paper is to present the concept of a national online degree programme network that is currently being developed in Finnish HE as part of a ministry-funded project. The project FONE (Flexible Online Education) aims to create a national online degree programme network in Finland that creates the framework and practices for offering flexible education responding to the needs of the working life. The network offers a possibility to achieve wider degree-leading study opportunities in collaboration with HE partners in digital context. Needs and expectations for online degree programmes through qualitative interviews with various stakeholder groups are presented.

The project FONE also aims to support pedagogical development of HE education by creating practices and models for online degree programmes. Online degree programmes as a new mode of study in HE can support the needs of continuous learning as part of future working life. The work is based on four visions for implementing online degree programmes in national collaboration in the future. In addition, future scenarios and examples of using the visions for online degree networks are presented.

Keywords: online degree programmes, networks, higher education

1. Introduction

Digitalisation and changes in society have created the need for developing new ways of learning. Disruptions in education are caused by various unexpected situations, such as the lock-down during the recent pandemic, causing many educational institutions to move their teaching and learning online full-scale (Naidu, 2021). Students wish to have flexible opportunities to combine study and work. Working life is also changing and remote work is placing new expectations to higher education (HE), where new study modes are necessary to create even more flexible and continuous learning paths. Online degree programmes can offer new solutions to future education (Joshi, 2022).

As a flexible possibility, online degree programmes enable achieving a HE degree in a way that is not tied to a physical location. Online degree programmes are HE study programmes that lead to a degree, and where education and support services are offered online the entire duration of the degree. They differ from blended study programmes where some parts of the studies are offered on campus, even though the definitions of online and blended degree programme are sometimes used interchangeably (Joshi et al., 2022). In online degree programmes, online learning is defined as "real-time, interactive, instructional and community-based" (Joshi et al., 2022, p. 10). They are especially attractive as a study option for those students whose life situation makes it difficult to attend classes on campus due to work, family, travel or other personal reasons. Completing a degree online consists of both independent and collaborative study with guidance from teachers and other professionals of the educational institution. It can strengthen the students' digital skills but also give possibilities for professional development of teachers in both national and international contexts.

The purpose of this paper is to present the concept of national online degree programme network that is currently being developed in Finnish HE as part of a ministry-funded project. The work is based on future visions of online degree programmes developed as part of a previous national ministry-funded project (Joshi et al., 2020) that aimed to create a year-round national online study platform for universities of applied sciences in Finland (Scheinin et al., 2017). The project FONE presented in this paper continues the future foresight work and presents possible scenarios for online degree programmes in the future. In addition, results of the preliminary analysis of the needs and expectations for online degree programmes through qualitative interviews with various stakeholder groups are presented. Online degree programme networks as a field-specific approach are presented. Also, online degree programmes as a new mode of study in HE to support the needs of continuous learning as part of working life is discussed in the context of national collaboration.

1.1 The project FONE

The project FONE (Flexible Online Education) aims to create a national online degree programme network in Finland that creates the framework and practices for offering flexible education to the needs of HE and working life according to the principles of sustainable development and continuous learning. The network offers a possibility to achieve wider degree-leading study opportunities in collaboration with HE partners in a digital context. In addition, it aims to support the pedagogical development of HE education by creating practices and models for online degree programmes.

More specifically, there are three main objectives for the project (TurkuAMK, 2021):
1. To create an online degree programme network and strengthen the national collaboration for offering online degree programmes and conducting research on them in the future.

2. To create guidelines for ways of working and implementing national online degree programme networks together with partners, e.g., development of online pedagogy and supporting the students' engagement and wellbeing with new technologies and innovations.

3. To identify the need and subject areas for new online degree programmes, either already existing or yet unforeseen, that could be offered in national collaboration for both Bachelor and Master level higher education, e.g., to answer the needs of sustainable development and internationalization.

In Finland, there are two different types of higher education institutions (HEI), universities of applied sciences and science universities, which both offer Bachelor and Master level degree programmes. The universities of applied sciences are multidisciplinary HEIs that focus on work-life oriented learning and provide education for professionals for the benefit of the local region, whereas the main task of science universities is to engage in scientific research and provide the highest level of education it in (Ministry of Education and Culture, n.d.). In some parts of Finland, regional university groups have been established to provide education in networks.

The current project partners are five universities of applied sciences in Finland that represent different various geographical locations, size, degree programme offering and expertise in terms of online degree programmes. During the project, other universities of applied sciences and science universities are invited to participate in the national network or utilise the outcomes of the project.

2. Future Visions for Online Degree Programmes

The visions for online degree programmes in the future (Joshi et al. 2022) were created in a previous ministry-funded project where a platform for year-round online studies for flexible and accessible higher education was created in national collaboration amongst all universities of applied sciences in Finland.

The four visions are (Joshi et al., 2022):
1. Freely formed online degree within the network
2. Moving from campus to online degree within the network
3. Creating new online degrees in collaboration in the network
4. Offering existing degrees jointly in collaboration in the network.

The current project FONE continues to work with the visions by focusing on the following new questions that are relevant for the project and national network: What would be the role of the national online degree network in each vision? What are the opportunities and challenges for the national online degree programme network? For each vision, the perceptions found in the project FONE are combined with the original vision work (Joshi et al. 2022, 45-53). The results of this qualitative work are presented below.

In terms of Vision 1 (Figure 1): A Freely formed online degree programme, the project FONE found the following important aspects to be considered for the national network. The student is not dependent on the study option or selection of a specific higher education institution. In contrast, the student can select studies freely from all higher education institutions in the network. When the required number of studies has been completed, the degree is applied for from any higher education institutions in the network. This vision is the wildest and freest of four visions, and its challenges are traditional education structures, operational practices, funding, and legislation. The degree is based on the student's interests and what kind of studies are relevant to them. The network should offer centralized career guidance and support services for students. Artificial intelligence can be used in recommending and selecting studies and compiling the degree parts. It can utilize the open university and open university of applied sciences studies, specialization studies, micro degrees, or other

partial attainments. The network can play a significant role in cooperation with and training competence for working life.
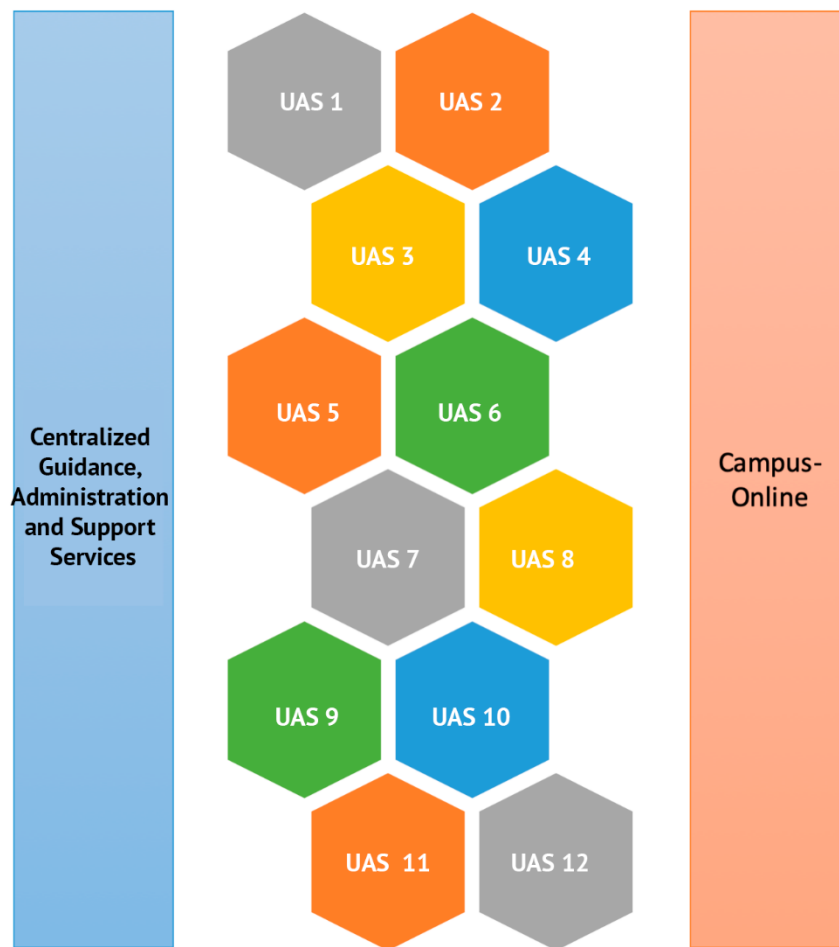
Figure 1. Vision 1: A freely formed online degree programme (Joshi et al. 2022, p. 47)

In terms of Vision 2 (Figure 2): Moving from a traditional degree programme to an online degree programme, the following aspects were determined important in the project FONE. The opportunity for an online degree programme is offered to students completing regular degree programmes. The basic studies of the degree are completed on the campus of the home institution, and the remaining part of the degree is entirely online. Studies can be selected freely from all the higher education institutions in the network. The degree is applied for one's own university. The student gains experience on-campus and online studies and enables moving to working life after basic studies. This vision permits locality and cooperation in the network enabling specialisation and profiling for students, teachers, and higher education institutions. This is especially important for specific fields of study or degrees implemented in only few universities. Trusting each other's expertise and sharing good practices is important.
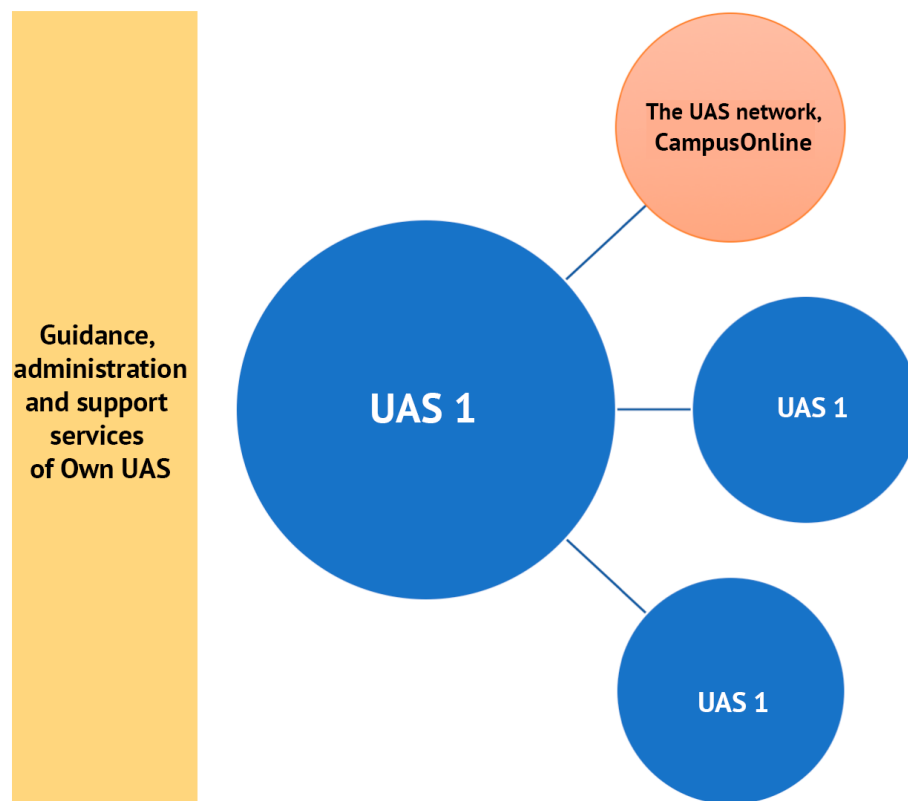
Figure 2. Vision 2: Moving from traditional to an online degree programme (Joshi et al. 2022, p. 49)

In terms of Vision 3 (Figure 3): A new, joint online degree programme, the project FONE found the following key points to be considered. The network, in cooperation, creates a new degree programme and competence-based curriculum. There needs to be forecasting and analysing of the environment to build an up-to-date and attractive degree for the network. It also enables micro degrees or other different types of completion methods. The joint degree programme is implemented by a cooperation network of higher education institutions and other operators like an international or working life partner. Students take studies from the higher education institutions in the network and receive a degree from the network. The network should have centralised administration, students' career guidance and support services. Active cooperation between operators is central, and development responsibility and methods must be agreed upon in the network.
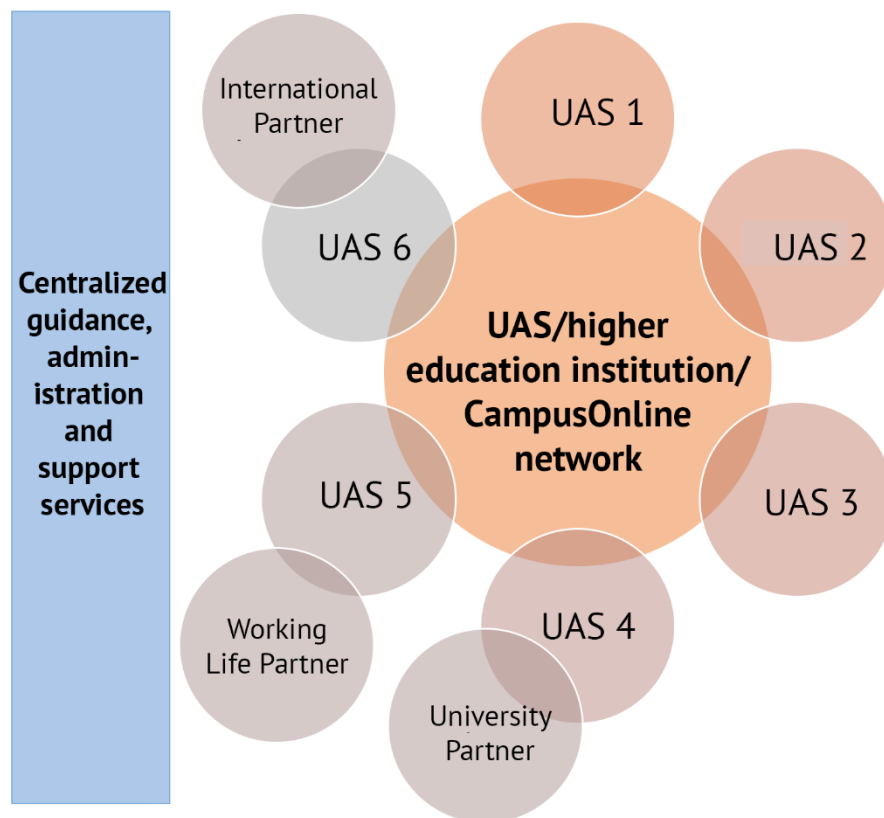
Figure 3. Vision 3: A new, joint online degree programme (Joshi et al. 2022, p.51)

In terms of Vision 4 (Figure 4): An existing, joint degree programme, the project FONE found the following important points. The network consists of universities that already have online degree programme and offer it jointly. The student applies for a degree in their home institution, which is implemented in cooperation with the field-specific or degree-specific network. This vision enables an extensive study offering, and profiles universities and teachers according to their expertise. In addition, contents can be jointly produced and offered. Small entities towards a broader online network degree can be produced, thus increasing resource efficiency. Time and resources for coordination, pedagogical cooperation, and national competence-based curriculum development are required.
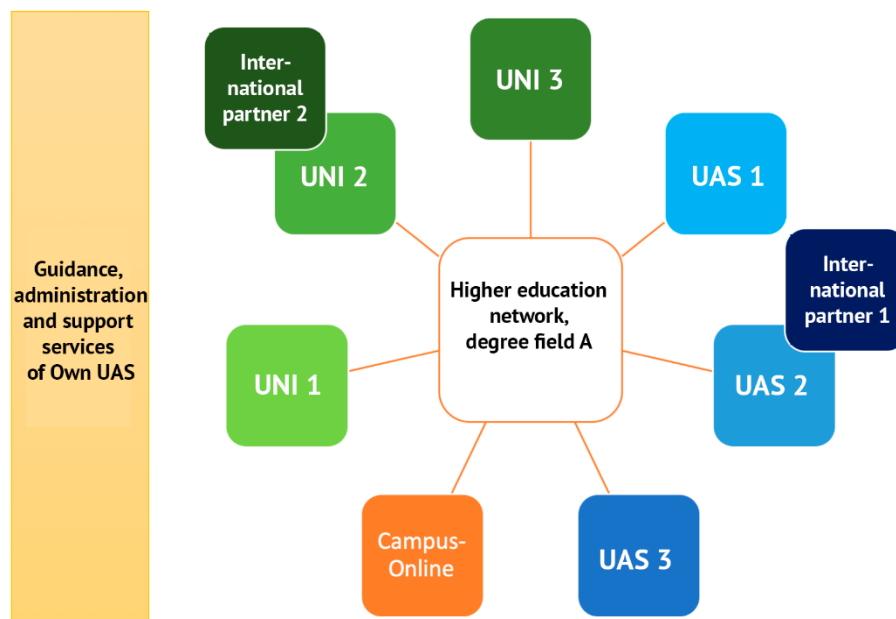
Figure 4. Vision 4: An existing, joint degree programme (Joshi et al. 2022, p.53)

The afore-mentioned visions can be used in many different ways, by applying one vision or a combination of different visions, to create new online degree programmes in HE.

2.1 Using future visions to create a pilot model

In Oulu University of Applied Sciences, two visions were combined to create a unique model to be piloted in nursing education (Mäenpää et al., 2022). This model (Figure 5) would partially combine the visions 2 and 4, where students would create their own individual study plans and get guidance from their own HEI. They complete basic and professional studies from the online degree programme network and study the clinical exercises included in the nursing degree at their own HEI or agree on their accreditation of studies. The student completes practical training and on-the-job learning in accordance with the guidance practices of their own HEI. Theoretical studies and clinical exercises are completed according to the study requirements, and competence is ensured on a competence-based basis. The student completes the thesis in accordance with the degree requirements of their own university of applied sciences. Students apply for a degree from their own university of applied sciences.
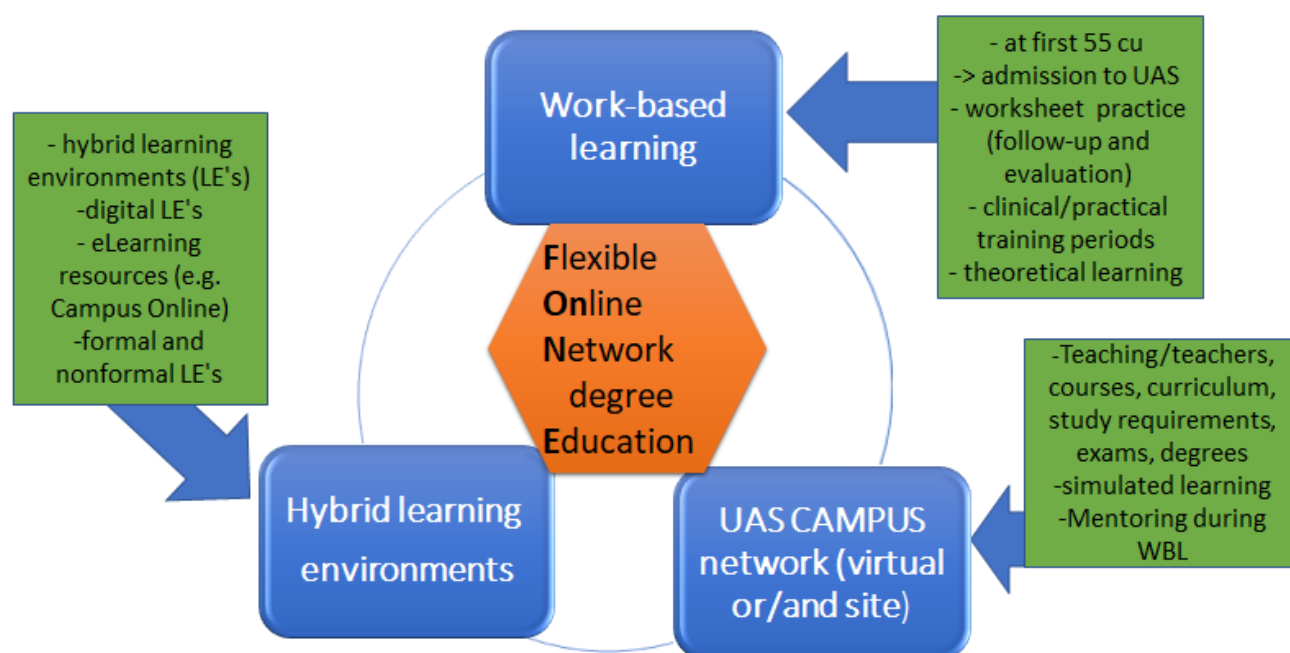
Figure 5. Mixed work-based learning and hybrid learning model in undergraduate nurse education, Oulu University of Applied Sciences (Mäenpää et al., 2022)

Currently, this flexible e-learning model is being developed and piloted in cooperation with the health services of a local city. The pilot model utilises online studies and accreditation of learning. The studies take into account the needs of working life and competence-based approaches, as well as digitalisation.

2.2 Scenarios through future foresight
Through foresight methods of observing weak signals, trends and phenomena, followed by enquiries and discussions with expert groups, different future scenarios can be created. These scenarios can be used to create future competence descriptions for various professional clusters, as well as for curriculum development to develop degrees that answer the future working life needs. The Southwest Finland Foresight Academy is a collaboration network that connects professions and industries for forecasting and foreseeing the regional competence and educational needs (The Southwest Finland Foresight Academy, n.d.)

A workshop by the Foresight Academy was held with the FONE project group to determine what kind of future scenarios could be identified for online degree programmes through these methods. The background variables for the scenarios were: pedagogy, changing working life, development of professional clusters, development of wellbeing society, digitalisation and automatization, AI, digital footprint, population growth, HEI ownership models, availability of teaching staff, and regional development.

Four main scenarios were created as a result of the foresight work: Responsible pedagogy, Regional Business as Usual, Centralised future and Working life oriented HEIs. The results for each are presented below.

In Scenario 1, Responsible pedagogy, the following key aspects were identified. The working life has come to a turning point where digitalisation and technological advancements have created a green transition as a reaction to challenges created by the climate change. In addition, HEIs have a pedagogical leadership that have

pedagogical degrees and competence. Online degree programmes produce graduates that have digital competence, and this has been noted. Digital carbon footprint is measured, and it is influencing the choices in the organisations. Ethical algorithms are a focus of discussion. There is close global collaboration amongst HEIs in co-creating and offering international onlien degree programmes as well as new joint blended degrees. All degrees can be offered also as an online version. There are efforts to have the entire country inhabited and HE studies can be accessed from any location. The Finnish language still holds its place as the main language. Continuing education as a principle enables the use of education vouchers. Ecosocial civilisation and culture as part of wellbeing are important. External funding is used to benefit degree-leading education.

The following aspects were listed as key elements in Scenario 2, Regional Business as Usual. The regions become more separated and different regions use different solutions. Health and social services reform has an influence on the regional development, and the change is ongoing. Pedagogical leadership varies depending on the region, where some have a rector, others have a team or another leadership solution. Online degree programmes are produced outside of capital area or larger cities. Technology or trade are not affected as business fields. There is a possibility to study online and collect the study credits to gain a degree if there are no suitable degrees on offer in one's own locality. People want to take their online degree in their own local HEI. New HEIs that offer education in different languages are formed. International HEIs set up offices in Finland.

In Scenario 3, Centralised future, the key aspects were the following. Science universities and universities of applied sciences have merged. The total number of HEIs has decreased significantly. One science university leads the pedagogical development, others follow. A digital university produces online degree programmes. The speed of study is a key criterion for selecting the study place. Amazon Edu is a main partner.

In Scenario 4, Working life oriented HEIs, the key aspects identified are as follows. Pedagogy in HEIs is lead by a joint team formed by representatives from companies and HEIs. Companies define things, and private HEIs are formed. Economic growth is the basis. Digital inequality defines the society but also enables. Climate issues are not defining actions. Employment rate/employability defines. Continuous learning is done together with the working life of the region. Dividing degree education into micro credentials is a key phenomena. International universities become more common in Finland.

Scenarios can be used to anticipate changes or new directions for online degree programme networks. The project FONE continues to utilise the scenarios in the development of national online degree programme networks.

3. Needs and expectations for cooperation in online degree programmes

A preliminary analysis of the needs and expectations for cooperation in online degree programmes through qualitative themed interviews with various stakeholder groups was held in the project. The aim was to investigate experiences and perceptions of the needs and expectations for online degree programmes network.

The participants were stakeholders from field-specific or multidisciplinary networks between higher education institutions nationally and internationally and business life. The interviewees already had experience with online degrees or online teaching. The method for collecting data was the thematic interview, and the themes were online teaching practices, student guidance, used technology, online degrees, and the operation of the network. The project's actors conducted nine interviews. The results of the interviews were presented and

analysed thematically together in project meetings. The questions regarding the operation of the network and the need and expectations for online degrees are presented below.

Some of the networks are more informal, for example, higher education actors of a previous joint project or those created based on the teaching staff's joint activity. Some are more official networks, organised and managed through cooperation agreements between HEIs. During the pandemic, the course offerings of the networks and the network's meetings were mainly moved online. It increased the need for online teaching, especially the development of field-specific solutions. Regular network meetings and cooperation in the development of digital pedagogy were perceived as important. The networks organised for example, Digi Café events, published blog posts, and tested software and devices. In addition, guides or instructions were created for the teaching staff to help design and implement online learning. The networks also agreed on pedagogical approaches and quality principles.

The networks offer field-specific, multidisciplinary, and generic skills studies for students. There are individual courses, study units, professional specialisation studies and whole degrees. It is possible for teachers or higher education to divide the implementations into smaller sets of responsibilities or the course's responsibilities based on special expertise. Some of the teachers have also done innovative online teaching experiments together where joint project was used for collaboration. In addition, teachers have agreed upon which tools and platforms to use in the network. Unfortunately, there is no certainty that successful implementation will become a permanent practice after the end of the funding of a joint project.

The results indicate a need for both multidisciplinary higher education networks and field-specific networks. Networking is an opportunity to succeed in the future. It is possible to offer entire online degrees, parts of the degree and individual courses in national networks. In addition, micro degrees, MOOCs and specialisation studies were mentioned, especially for the need to create more opportunities for continuous learning and professional development. The interviewees felt that HE curricula and offerings often respond slowly to the competence needs of working life. Field-specific online degree networks should therefore work in close cooperation with working life.

National cooperation in competence-based curriculum development and similar structures in the curriculum facilitates collaboration between higher education institutions. The profiling and specific expertise of the higher education institutions function as an enabler of synergy between the institutions in terms of course offerings and research and development. A joint online degree programme implemented by a cooperation network of higher education institutions and other operations can be useful in new competence areas, such as sustainable development or competence gaps caused by structural changes. Online degree programmes can offer students competence that cannot be achieved by participating in the studies offered by a single university only.

The interviewees experienced that participation in the networks develops the teacher's professional competence, the field of education and the world of work. Building networks and joint course offering take a significant amount of time, as shared operating models, administration, and structures are needed. The joint programme of Finnish higher education institutions, Digvisio2030, was felt to support the networking and the building of joint offerings in the future. Digivision 2030 (n. d.) is a joint programme of all 38 Finnish higher education institutions, and it aims to produce national digital service platform to enable the compatibility of digital services between HEIs, improve the compatibility of actors' information management, digitalise study administration processes, establishes artificial intelligence solutions as a guidance tool and lowers the threshold for utilising national solutions.

According to the interview results, also collaborative methods and collaborative pedagogy are seen as an important part of online degree education (Lundbom & Timonen, 2022). The aspects of collaborative work that seem to raise discussion are related to the definition of collaborative learning, group-based processes organising collaborative entities and evaluating teachers' role in the collaborative process.

3.1 Setting up field-specific national networks

One example of a field-specific online degree programme network that has started during the project FONE is social services. The network is called eSosionomi (Bachelor of Social Services Online). The work started with the FONE project's aim to create national networks for online programmes, and the idea for a subject-specific network was approved in the Finnish National University Network for Social Work. An invitation was sent to all universities of applied sciences who provide degree education for social service to take part in the network. In total, seven universities of applied sciences expressed interest. A questionnaire was sent to the interested parties about the project FONE aims and key themes. The first meeting of the network was held at the end of 2021, with the aim to decided on the aims of the collaboration, to discuss the benchmarking results and to agree on a joint workshop.

The specific aims of the new network are:
1. To create a social services online degree programme network
2. To develop online pedagogy and ways of working for social services field, focusing on working life connections, with the aim to create more current and flexible degree education
3. To involve students of social services field in developing wellbeing and utilising new technologies in digital learning environments.

The first student project set by the new subject-specific network started in the spring of 2022. The student project focuses on student wellbeing in online degree programmes by bringing in the view of the online degree programme students. The main research question focuses on how the digital environment and teaching supports the wellbeing and engagement of the online degree programme students. The preliminary findings show that online degree programme students seem to have similar needs to campus-based students in terms of wellbeing. They seem to find the support of other students and student tutors (older students) very important. The students expressed several ideas for developing wellbeing and collaboration. Some students seem to have a need for meeting in physical premises and face-to-face, whereas others were fully satisfied with online only. Based on the results, comparative research on the effects of different implementations online on student wellbeing are needed.

Another example of the beginning of a field-specific online degree programme network is found in music education, where there is a need and desire to do national and international cooperation (Korhonen, 2022). Collaborative projects, such as MUSE and New Time Music 2.0, have promoted the ideas of sharing responsibilities in the area of expertise, multidisciplinary arts projects, flexible study paths for students, and a view of a new kind of music profession. In Finland, music education units are small, and cooperation in the network is seen as an opportunity.

Work to develop international networks is also ongoing. A good example of these are the European University alliances, e.g., Regional University Network (RUN-EU) and Ulysseus European University. These networks develop joint study offers and degrees or double degrees and promote research activities.

4. Conclusions

Changes in the world outside the walls of higher education institutions, combined with the experiences of remote learning during pandemic, promote the development of new flexible study models. Cooperation between higher education institutions has increased in recent years, and regional, field-specific, national or international networks offer more online study opportunities for degree students and continuous learners in Finland. The results of the interviews show that the networks offer mainly smaller entities and courses online, but in the future there seems to be an interest in offering complete online degrees or larger study units in cooperation.

Participation in the national Digivisio2030 (n.d.) network was seen very important, as it develops the teacher's professional competence, the field of education and the world of work. The aims of these two projects coincide and support each other, and the project FONE collaborates with Digivision2030 to reach these aims. As an example, the project FONE is creating a webinar series in collaboration with Digivision 2030 to share good practices for setting up new online degree programme networks and engage participants to develop online degree collaboration.

During the project, other universities of applied sciences and science universities are invited to participate in the national network or utilise the outcomes of the project. In addition, HE actors nationally and internationally are invited to join the ongoing discussion about developing online degree programmes in HE.

National collaboration in offering online degree programmes can enable joint development of online pedagogy and curricula, create new possibilities for specialisation paths, bring new resource-efficient solutions, and enhance internationalisation through shared platforms and the use of new technologies. For students, national collaboration offers flexible study opportunities with wider course selection and engagement to study in a programme designed to support the competences for the future career and society.

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Opinions and attitudes of postgraduate students of the Hellenic Open University on the role of Tutor - Counselor in the electronic distance Group Tutorials Meetings during the period of covid-19.

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Abstract

Within the Hellenic Open University (HOU), Group Tutorials Meetings (GTM) or Contact Sessions (CS) are institutionalized meetings that take place between Professors - Counselors and students. They are based on the voluntary participation or attendance of the trainees and are implemented within the framework of each Thematic Unit (THU) that the trainees have chosen (Lionarakis et al., 2019).

The development of open and distance education programs goes hand in hand with the development of Information and Communication Technologies (ICT). In the context of technological development, more and more modern services are provided to the trainees. Among these services are teleconferencing. The utilization of teleconferences is also carried out by the HOU (Panagiotakopoulos et al., 2013; Lionarakis et al., 2020).The GTM, while they were all alive until 2016, the distance electronic Group Tutorials Meetings (e - GTM) gradually began to appear from the academic year 2017-2018 until their full prevalence in the academic year 2019-2020, a fact that is also due to emergency conditions of the coronavirus pandemic from February 2020 onwards.

With the implementation of measures to combat the coronavirus, most of the university institutions worldwide have led to the adoption of distance education using online platforms to ensure physical / physical distance between participants. Although many studies have been conducted on the impact of the pandemic on university teaching, a wealth of research data has not been identified on the impact of e- GTM on student teaching (Patsali et al., 2020).

In this context, the new data and problems experienced by both students and Tutor – Counselor (TC), during the coronavirus period, it is necessary to research in detail (Trust & Whallen, 2020), because this will contribute to the deepening of the implementation of e- GTM by highlighting its capabilities and limitations, in gaining competence and readiness for effective support in similar future situations and consequently in the support of TC to respond to them.

In continuation of the above problematic and in combination with the bibliographic review of research, the object of the present research is to investigate the views and attitudes of postgraduate students of HOU about the role of TC in e- GTM during the period of covid-19.

The population of the research is all the students of the Postgraduate Program "Education and Technologies in distance learning and learning systems - Education Sciences" of HOU who participated in Electronic Monitoring Departments and attended e- GTM during the last two years (2020 - 21 and 2021 - 22) during the pandemic. The sample was selected by the method of "clustered" random sampling.

A structured questionnaire with 10 "closed" five-point Likert scale questions was used as a research tool to carry out the proposed research and data collection.

Statistical analysis, processing and interpretation of the empirical data had not yet been completed when this summary was submitted. However, once completed - using the SPSS 28 statistical package - it is found that the role of TC in e-GTM had an overall positive impact on student satisfaction.

Keywords: Tutor - Counselor, Hellenic Open University, opinions, students, e- Group Tutorials Meetings, covid-19

1. Introduction

Group Tutorials Meetings (GTM) or Contact Sessions (CS) is a strategy used in international and Greek open and distance education programmes. The GTM are one of the most popular ways of providing support to learners in open and distance education programmes. The purpose of the meetings is both to provide support in relation to the educational performance and progress of the students and to meet their psychosocial needs as learners (Gillett - Swan, 2017).

In addition, there are also literature reports where the importance of GTM is demonstrated by the expectations and satisfaction of the trainees from them (Moschouri & Apostolakis, 2017). The international literature (Fung & Carr, 2000; Stevenson, Sander & Naylor, 1996; Moschouri, 2017) records expectations for three types of support: cognitive (support and development of learning), emotional (reinforcement and psychological support) and systemic, such as the provision of information and practical advice for organizing studies (Moschouri & Apostolakis, 2017; Gillett-Swan, 2017; Tait & Mills, 2002).

The aim of GTM implementation is to provide support to learners and meet the full range of their needs. In this context, short group meetings are held, involving the teacher and the trainees attending the course. The GTM can take different forms, which are determined by the aims and structure of the training programme: they can be teleconferences, face-to-face seminars or even formal teaching (Moschouri & Apostolakis, 2017).

In many cases, the GTM address the voluntary participation of students, who recognize their needs and wish to have them met. In this way they interact live on a verbal and non-verbal level. Live interaction is the key feature of GTM, which is present in international and Greek educational programs (Keegan, 1996; Moschouri & Apostolakis, 2017).

At the Hellenic Open University (HOU), GTM are four-hour seminars, which take place for a certain number of hours per year depending on the programme chosen by each student and together with the written assignments, they constitute the teaching work of the tutor or Tutor-Counselor (TC) and form the relationship with them. They are based on the optional participation or attendance of the students and are implemented in the context of each Thematic Unit (TU) chosen by the students (Manousou, 2013; Lionarakis et al., 2019). They take place five (or three) times during the course of an annual (or semester respectively) TU with the aim of "acquiring" the knowledge of the female students through the scientific and pedagogical advice provided by the TC. The TC during their conduct makes sure that the communication between the TC and the students as well as between the students themselves is developed. He also informs students on how to study the educational material, gives useful guidelines for the preparation of written assignments, helps students to communicate with each other, explains obscure parts of the material and records and forwards any requests of the students to the Module Coordinator (Martsoukou & Papadimitriou, 2019).

Until 2016 at HOU the GTM were all face to face. Beginning in the 2017-2018 academic year, remote electronic Group Tutorials Meetings (e-GTM) or Tele - Contact Sessions (T – CS) began to gradually appear. The e-GTM take place in the form of teleconferences. In recent years, e-GTM with the use of teleconference have become a key means of communication between the lecturer and the learner in Distance Education, as a result of the evolution of technology and the use of the internet for educational purposes. They bridge the distance and time between lecturer and learner, as well as being characterized by low economic costs of their implementation (Kanellopoulos & Koutsouba, 2020).

Particularly in recent years, teleconference has been shown to contribute decisively to the creation of an innovative learning and teaching environment at all three levels of education and in particular in the e-GTM

implemented by HOU (Armakolas, Panagiotakopoulos & Magkaki, 2018). More specifically, teleconferencing tools are constantly evolving and new perspectives are emerging. The use of "collaboration rooms" give new perspectives to the teamwork process. The contribution of chat rooms, the continuous integration of new options and tools offered by teleconference platforms facilitate the instructor and give him/her many options (Armakolas & Panagiotakopoulos, 2021). The educational use of teleconference can create new possibilities and contribute significantly to the development of the social skills of the participants, the cultivation of a spirit of cooperation and the active participation of the trainees (Armakolas, Panagiotakopoulos & Magkaki, 2018; Armakolas, Panagiotakopoulos & Karatrantou, 2018; Armakolas & Panagiotakopoulos, 2021).

However, in these new circumstances, it is required for both instructors and learners to adopt new roles and acquire additional skills (Armakolas & Panagiotakopoulos, 2020). In this sense, the design of an educational videoconference is particularly challenging compared to a traditional face-to-face teaching (Armakolas, Panagiotakopoulos & Karatrantou, 2018). The teaching methodology, should create the necessary conditions for the active participation of the learner in a process where she can process information in a critical way and transform it into knowledge (Mavroeidis, Giosos & Koutsouba, 2014). In order for the learners to feel satisfied, it is important that her educational needs are met in a multifaceted way, as they are adults (Armakolas & Panagiotakopoulos, 2020; Kounatidou & Mavroeidis, 2020).

In conjunction with the above, it is worth noting that in both face-to-face GTM and e-GTM, a key role in the distance learning process is played by the instructor, who is required to prepare and organise the GTM (Martsoukou & Papadimitriou, 2019). However, in the context of conducting the e-GTM, the lecturer in a environment teleconferce has a multiple role since he/she guides, advises and inspires his/her students while trying to use the new technology and needs to develop skills that meet the new needs. The instructor is called upon to meet the challenge of creating a collaborative climate and mutual interaction in online learning environments, encouraging learners to interact with each other and reducing any problems that arise (Arbaugh, 2014). For the instructor to achieve the most effective teaching possible, it is necessary to balance between the proper structuring of the lesson and the dialogue of the class members around the thematic area of the lesson in question (Armakolas & Panagiotakopoulos, 2021).

Instructors in online learning environments have lots of pedagogical approaches and e-communication tools available to them, such as forums and discussion boards that allow direct communication and support teamwork (Armakolas & Panagiotakopoulos, 2021; Donlan, 2014; Tess, 2013). At the same time, a number of pedagogical factors are involved in the learning process, such as the characteristics of the learners, the very nature of the educational subject, the objectives and the teaching methodology chosen by the instructor (Armakolas & Panagiotakopoulos, 2021; Hawkins et al., 2013; Joksimovic et al., 2015). Instructors can utilize several strategies to encourage active learner participation, such as monitoring learners' progress and participation by providing guidance and feedback (Armakolas & Panagiotakopoulos, 2021; Cho & Cho, 2016; Papadimitriou, 2014; Papadimitriou & Lionarakis, 2016).

At the same time, it is worth to mention that the use of teleconference and especially e-GTMs were enhanced and universally implemented during the covid -19 pandemic period not only in Open Universities based on distance education programmes but also in conventional Universities (Al - Salman, Haider & Saed, 2022; Kapasia et al, 2020). In this case, face-to-face education was replaced by an attempt to continue the educational work at a distance, achieved through the use of various teleconference systems (Carrillo& Flores, 2020; Daniel, 2020; Koustourakis & Panagiotakopoulos, 2021; Lemay, Doleck, & Bazelais, 2021; Moorhouse, 2020). The same happened with HOU, as from the academic year 2019-2020, the e-GTM will be fully implemented in the undergraduate and postgraduate programmes.

For many distance education researchers (Vlachopoulos, 2020), the crisis caused by the covid-19 pandemic was seen as a unique opportunity for the implementation of distance education in universities. Currently, discussions have increased about the concept of Open Education and the problems it has caused regarding access to higher education, while e-learning is the focus of many researches and studies (Essel, Vlachopoulos, Adom & Tachie - Menson, 2021). Although there are several studies on the impact of pandemic on teaching in universities, a large body of research data regarding the impact of e - GMT in student teaching is not found (Koustourakis & Panagiotakopoulos, 2021; Patsali et al., 2020; Xanthopoulou & Lappa,2021).

In this context, the new data that have been created and the problems experienced by both students and TC, during the period of the coronavirus, it is necessary to investigate thoroughly (Trust & Whallen, 2020), because this will contribute to deepening the implementation of e-GTM by highlighting its potential and limitations, to gaining competence and readiness for effective support in similar future situations and, by extension, to supporting TC to respond to them.

According to the above, the scope of this research is to explore the opinions and attitudes of HOU postgraduate students on the role of TC in e-GTM during the covid-19 period.

2. Method

2.1 The aim of study

The main aim of this study is to investigate the opinions and attitudes of HOU postgraduate students about the role of TC in e-GTM during the covid-19 period.

2.2 Research question

The main research question of this study is the following: "Which are the opinions and attitudes of HOU postgraduate students about the role of TC in e-GTM during the covid-19 period?".

2.3 Sample

The population of the research is the total number of students of the Postgraduate Programme "Education and Technologies in Distance Teaching and Learning Systems - Education Sciences" of HOU who participated in e-monitoring courses and e-OSS in the last two academic years (2020 - 21 and 2021 - 22) during the pandemic period.

The research was conducted during the period from the beginning of May to the end of June 2022.

The research sample consisted of 85 postgraduate students. In terms of gender, 9 are male (9.5%) and 76 are female (90.5%). The ages of the 85 postgraduate students are distributed as follows: under 30 years old are 28 (32.9%), 31 - 40 years old are 27 (31.8%), 41 - 50 years old are 25 (29.4%), 51 and over are 5 (5.9%).

The sample was selected using "clustered" random sampling (Cohen et al, 2000) from a list of all postgraduate students of the HOU's Postgraduate Programme in Education and Technologies in Distance Teaching and Learning Systems - Education Sciences. More specifically, 150 postgraduate students were randomly selected from the total list of 1,000 graduate students. Then, from the 150 postgraduate students, a sample of 85 postgraduate students who completed the questionnaire was formed.

2.4 Data collection

For the implementation of the proposed research and for data collection, was used as a research tool a structured questionnaire with "closed" type five-point Likert scale questions, which facilitate the connection with the objectives and research questions of the proposed research (Robson & McCartan, 2015) and satisfy

the following two parameters: that their values are mutually exclusive and cover the whole range of possible answers.

Closed-ended questions offer the possibility of more controlled standardisation of the collected data and through this effective comparisons of responses, are easy to understand and specific in their answers (Friborg & Rosenvige, 2013:1398). Also, "closed-ended" questions offer the same response options to all survey participants, yielding data that are easier to administer and statistically processable (Gaskell et al., 2016:1039).

At the same time, the scale was chosen up to 5 to give more reliability with the existence of several alternative answers. The options are as follows: 1= Not at all, 2= Slightly, 3= Moderately, 4= Very, 5= Extremely.

However, it is necessary to point out some disadvantages of the research tool, which are both the limitation and "rigidity" of the "closed" type of questions and their grouping into general categories for the collection of information. To limit these, in addition to pilot testing, it was sought from the beginning to properly design and formulate research questions that are specific, observable on the variables and measurable (Creswell, 2014).

The questionnaire was constructed on the Google Forms online platform because this allows it to be shared in a short period of time with the survey subjects and "allows us to have large samples of responses with relatively little additional effort" (Robson & McCartan, 2015). In addition, this ensures the anonymity of the survey subjects, which is a key element of the reliability of the survey.

The link created corresponding to the questionnaire was emailed to the survey subjects. Upon completion of the questions and submission, the questionnaire database was updated in real time to allow immediate access to the research data for further statistical processing and analysis by the researcher. At the same time, uniqueness in the completion of the questionnaire for each research subject was also ensured.

The statistical analysis, processing and interpretation of the empirical data was carried out using the statistical package SPSS 28. More specifically, the analysis of the questions was performed as follows:

- first, a reliability test of the questionnaire was carried out with the Cronbach's Alpha index.
- then, an analysis of the frequencies obtained from the recordings of the responses given was carried out.
- finally, a One-way Anova means test was carried out in order to establish statistically significant relationships between the variables. It is worth noting that no statistically significant correlations were found between variables such as age and gender.

In conclusion, a major limitation of the research is the number of the sample, which consists of 85 postgraduate students, who do not constitute 10% of the total population of 1,000 postgraduate students. Consequently, the results are not generalisable.

2.5 Reliability of the research tool

The reliability of the questionnaire was checked by Cronbach's Alpha reliability index and it was found that it has a value of a=0.857>0.7 in all 10 variables (Table 1 and 2). Consequently, the questionnaire is considered reliable due to the satisfactory and high value of the index.

Table 1: Case Processing Summary

		N	%
Cases	Valid	82	96,5
	Excluded[a]	3	3,5

Total	85	100,0

a. Listwise deletion based on all variables in
the procedure.

Table 2: Reliability Statistics

Cronbach's Alpha	N of Items
,857	10

3. Results

3.1 Data analysis by frequency for 8 variables - questions

By way of introduction, we mention that 8 of the 10 variables - survey questions will be analysed.

In variable-question (1): «To what extent do you consider that the e- GTM promote interaction (dialogue, participation, questions, etc.) between TC and students in teaching?» (Table 3), from the 85 graduate students who completed the questionnaire, 4 (4.7%) responded "Slightly", 22 (25.9%) responded "Moderately", 38 (44.7%) responded "Very" and 21 (24.7%) responded "Extremely". Consequently, a high percentage (about 69.4%) is found between the "Very" and " Extremely" responses (as shown below and in the Table 11 of Means and Standard Deviation).

Table 3: The frequencies in relation to the question - variable (1)

Variable (1)	Frequency	Percent (%)
Slightly	4	4.7
Moderately	22	25.9
Very	38	44.7
Extremely	21	24.7
Total	**85**	**100**

In variable-question (2): 'To what extent do you consider that with the e-GTM the TC has the possibility to differentiate his/her teaching taking into account the interests and needs of the students in teaching?" (Table 4), from the 85 graduate students who completed the questionnaire, 3 (3.5%) responded "Not at all", 8 (9.4%) responded "Slightly", 23 (27.1%) responded "Moderately", 33 (38.8%) responded "Very" and 18 (21.2%) responded "Extremely". Consequently, a high percentage (about 65.9%) is found between the "Moderately" and "Very" responses (Table 11).

Table 4: The frequencies in relation to the question - variable (2)

Variable (2)	Frequency	Percent (%)
Not at all	3	3.5
Slightly	8	9.4
Moderately	23	27.1
Very	33	38.8
Extremely	18	21.2
Total	**85**	**100**

In variable-question (3): 'To what extent do you think that with the e-GTM the TC can make use of alternative teaching techniques (brainstorming, conceptual mapping, etc.) in teaching?' (Table 5), from the 85 graduate students who completed the questionnaire, 5 (5.8%) responded "Slightly", 14 (16.5%) responded "Moderately", 39 (45.9%) responded "Very" and 27 (31.8%) responded "Extremely". Consequently, a fairly high percentage (about 77.7%) is found between the " Very" and " Extremely " responses (Table 11).

Table 5: The frequencies in relation to the question - variable (3)

Variable (3)	Frequency	Percent (%)
Slightly	5	5.8
Moderately	14	16.5
Very	39	45,9
Extremely	27	31.8
Total	**85**	**100**

In variable-question (4): "To what extent do you think that TC in e-GTM cooperatively (working groups, etc.) involves students in teaching?" (Table 6), from the 85 graduate students who completed the questionnaire, 5 (5.9%) responded "Slightly", 21 (24.7) responded "Moderately", 30 (35.3%) responded "Very" and 29 (34.1%) responded "Extremely". Consequently, a high percentage (about 69.4%) is found between the "Very" and " Extremely" responses (Table 11).

Table 6: The frequencies in relation to the question - variable (4)

Variable (4)	Frequency	Percent (%)
Slightly	5	5.9
Moderately	21	24.7
Very	30	35.3
Extremely	29	34.1
Total	**85**	**100**

In variable-question (5): "To what extent do you think that with e - GTM students develop skills of critical perception of information data in teaching?" (Table 7), from the 85 graduate students who completed the questionnaire, 2 (2.4%) responded "Not at all", 11 (12.9%) responded "Slightly", 22 (25.9%) responded "Moderately", 35 (41.2%) responded "Very" and 15 (17.6%) responded "Extremely". Consequently, a high percentage (about 67.1%) is found between the "Moderately" and " Very" responses (Table 11).

Table 7: The frequencies in relation to the question - variable (5)

Variable (5)	Frequency	Percent (%)
Not at all	2	2.4
Slightly	11	12.9
Moderately	22	25.9
Very	35	41.2
Extremely	15	17.6
Total	**85**	**100**

In variable-question (6): 'To what extent do you think that face-to-face teaching can be replaced by e-GTM?' (Table 8), from the 85 graduate students who completed the questionnaire, 5 (6%) responded "Not at

all", 11 (13.1%) responded "Slightly", 22 (26.2%) responded "Moderately", 34 (40.5%) responded "Very" and 12 (14.3%) responded "Extremely". Consequently, a high percentage (about 66.7%) is found between the "Moderately" and "Slightly" responses (Table 11).

Table 8: The frequencies in relation to the question - variable (6)

Variable (6)	Frequency	Percent (%)
Not at all	5	6.0
Slightly	11	13.1
Moderately	22	26.2
Very	34	40.5
Extremely	12	14.3
Missing Value	1	
Total	**85**	**100**

In variable-question (7): "In the case of extended use of e-GTM, to what extent can the sociality of students in teaching be affected?" (Table 9), from the 85 graduate students who completed the questionnaire, 5 (5.9%) responded "Not at all", 10 (11.8%) responded "Slightly", 24 (28.2%) responded "Moderately", 33 (38.8%) responded "Very" and 13 (15.3%) responded "Extremely". Consequently, a fairly high percentage (about 86.9%) is found between the "Moderately" and "Slightly" responses (Table 11).

Table 9: The frequencies in relation to the question - variable (7)

Variable (7)	Frequency	Percent (%)
Not at all	5	5.9
Slightly	10	11.8
Moderately	24	28.2
Very	33	38.8
Extremely	13	15.3
Total	**85**	**100**

In variable-question (8): 'To what extent do you think that TC during e-GTM encourages students to be actively involved in the learning process?' (Table 10), from the 85 graduate students who completed the questionnaire, 2 (2.4%) responded "Slightly", 29 (34.1%) responded "Moderately", 28 (32.9%) responded "Very" and 26 (30.6%) responded "Extremely". Consequently, a high percentage (about 67%) is found between the "Moderately" and " Very" responses (Table 11).

Table 10: The frequencies in relation to the question - variable (8)

Variable (8)	Frequency	Percent (%)
Slightly	2	2.4
Moderately	29	34.1
Very	28	32.9
Extremely	26	30.6
Total	**85**	**100**

Finally, no statistically significant correlations were found between variables such as age and gender.

3.2 Means and standard deviation of variables

The table below (Table 11) presents the means and standard deviation of the variables, which is a measure of how much the values of the variable differ from their mean (a small deviation implies a high concentration of the values of the variable around the mean, while a large deviation implies a low concentration and a larger "spread"). A five-point Likert-type scale was used with the following options: 1= Not at all, 2= Slightly, 3= Moderately, 4= Very, 5= Extremely. Consequently, the closer to 1 the average of a statement the more negatively respondents rated it and the closer to 5 the more positively respondents rated it.

Table 11: Means and standard deviation of the 8 question variables

Table of Means					
Question variables	**N**	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
Question variable (1)	85	2,00	5,00	**3,8941**	,83129
Question variable (2)	85	1,00	5,00	**3,6471**	1,03171
Question variable (3)	85	2,00	5,00	**4,0353**	,85143
Question variable (4)	85	2,00	5,00	**3,9765**	,91256
Question variable (5)	85	1,00	5,00	**3,5882**	1,00350
Question variable (6)	84	1,00	5,00	**3,4405**	1,07939
Question variable (7)	85	1,00	5,00	**3,4588**	1,07518
Question variable (8)	85	2,00	5,00	**3,9176**	,86205

From the teachers' answers to the variable - question (1), the mean is 3.8941 (standard deviation 0.83129), which means that it is close to 4, corresponding to the answer "Very". Consequently, the attitudes and opinions of the respondents are very positive (Table 11).

In the variable-question (2), the mean is 3.6471 (standard deviation 1.03171), which means that it is between 3 corresponding to the answer "Moderately" and 4 corresponding to the answer "Very". Therefore, the attitudes and opinions (or statements) of the respondents are positive (Table 11).

In the variable-question (3), the mean is 4.0353 (standard deviation 0.85143), which means that it is above the 4 corresponding to the answer "Very". Consequently, the attitudes and opinions of the respondents are very positive (Table 11).

In the variable - question (4), the mean is 3.9765 (standard deviation 0.91256), which means that it is close to 4 corresponding to the answer "Very". Consequently, the attitudes and opinions of the respondents are positive (Table 11).

In the variable-question (5), the mean is 3.5882 (standard deviation 1.00350), which means that it is between 3 corresponding to the answer "Moderately" and 4 corresponding to the answer "Very". Therefore, the attitudes and opinions (or statements) of the respondents are positive (Table 11).

In the variable-question (6), the mean is 3.4405 (standard deviation 1.07939), which means that it is between 3 corresponding to the answer "Moderately" and 4 corresponding to the answer "Very". Therefore, the attitudes and opinions (or statements) of the respondents are positive (Table 11).

In the variable-question (7), the mean is 3.4588 (standard deviation 1.07518), which means that it is between 3 corresponding to the answer "Moderately" and 4 corresponding to the answer "Very". Therefore, the attitudes and opinions (or statements) of the respondents are positive (Table 11).

In the variable - question (8), the mean is 3.9176 (standard deviation 0.91256), which means that it is close to 4 corresponding to the answer "Very". Consequently, the attitudes and opinions of the respondents are positive (Table 11).

4. Discussion

In question (1), namely to what extent the e-GTMs promote interaction (dialogue, participation, questions, etc.) between TC and students in teaching, it is found that the attitudes and opinions of students are positive since a high percentage (about 69.4%) is found between the "Very" and " Extremely" responses (Tables 3 and 11). In the related question (8), namely to what extent the TC during the e-GTM encourages students to be actively involved in the learning process, it again emerges that the attitudes and opinions of the students are positive since a high percentage (about 67%) is found between the "Moderately" and " Very" responses (Tables 10 and 11).

The data from questions (1) and (8) are also in line with recent research (Armakolas & Panagiotakopoulos; Berry, 2019; Coker, 2018; Martin et. al, 2019; Rose, 2018) where dialogue and classroom interaction appeared to be an important tool that instructors can utilize, as it enables them to interact directly with learners and encourage them to be more active in discussing and reflecting on course content and presenting new ideas. Also, in related research (Xanthopoulou & Lappa, 2021; Xanthopoulou & Kappou, 2021) where the characteristics necessary for the TC to possess in e-GMT to achieve student support were investigated, the responses revealed that the most important element is the TC's encouragement to the learners to ask questions during the e-GMT, as well as to motivate the learners towards learning.

For question (2), namely to what extent with the e-GTM the TC has the possibility to differentiate its teaching taking into account the interests and needs of students in teaching, it emerges that the attitudes and opinions of students are positive since a high percentage (about 65.9%) is found between the "Moderately" and "Very" responses (Tables 4 and 11). In similar studies (Koustourakis, 2020; Koustourakis & Panagiotakopoulos, 2021) graduate students report that in e-GMT when processing the different aspects of the academic knowledge of the subject unit, the experiences and experiences of the students need to be taken into account and utilized. In this case, there is a need to reframe and simplify the academic knowledge through examples that make it understandable and comprehensible to the learners.

For question (3), namely to what extent the TC can use alternative teaching techniques (brainstorming, conceptual mapping, etc.) in teaching, it emerges that students' attitudes and opinions are very positive since a fairly high percentage (about 77. 7%) is found between the " Very" and " Extremely" responses (Tables 5 and 11). In the related question (4), namely to what extent the TC in e-GTM involves students collaboratively (working groups, etc.) in teaching, it emerges that the attitudes and opinions of graduate students are positive since a high percentage (about 69.4%) is found between the "Very" and " Extremely" responses (Tables 6 and 11).

Similar findings to the data of questions (3) and (4) are found in the field of adult education (Valkanos, Papavassiliou - Alexiou & Fragoulis, 2009; Armakolas, Panagiotakopoulos & Fragoulis, 2019; Koustourakis, 2020; Koustourakis, G. & Panagiotakopoulos, 2021) where they highlight the importance of using participatory experiential techniques in education in the context of teleconference. Through the use of participatory experiential techniques, the pre-existing experiences, the particular characteristics, as well as the different learning styles of the learners are utilized (Armakolas, Panagiotakopoulos & Fragoulis, 2019; Armakolas, Panagiotakopoulos & Karatrantou, 2018). In addition, the literature review shows that the majority of teaching approaches utilized by instructors in online environments are learner-centered, with an emphasis on collaboration (group work, etc.) and active participation of learners in order to acquire new knowledge (Armakolas & Panagiotakopoulos, 2021; Berry, 2019; Coker, 2018;. Martin et. al, 2019).

For question (5), namely to what extent with e-GTM students develop critical thinking skills of information data in teaching, it emerges that students' attitudes and opinions are positive since a high percentage (about 67.1%) is found between the "Moderately" and "Very" responses (Tables 7 and 11). In line with these data, researches report that teleconference can create authentic interactive learning environments, contribute to

the cultivation of critical thinking and create the conditions for further individual path of knowledge discovery and personal development (Armakolas, Panagiotakopoulos & Magkaki, 2018? Armakolas, Panagiotakopoulos & Karatrantou, 2018; Armakolas & Panagiotakopoulos, 2021).

For question (6), namely to what extent can face-to-face teaching be replaced by e-GTM, it emerges that students' attitudes and opinions are positive since a high percentage (about 66.7%) is found between the "Moderately" and "Slightly" responses (Tables 8 and 11). Similar responses have been given in a recent survey (Xanthopoulou & Lappa, 2021) where postgraduate students typically report that in e-GMT the interaction created between lecturers and learners can be as effective as that of a face-to-face class under certain conditions.

For question (7),namely in the case of extended use of e-GTM to what extent the sociality of students in teaching can be affected, it emerges that the attitudes and opinions of students are positive since a fairly high percentage (about 86. 9%) is found between the "Moderately" and "Slightly" responses (Tables 9 and 11). In similar studies, teachers and students find that teleconferences differs significantly from face-to-face interactions because mainly physical conversation patterns are lost (Massner, 2021). Furthermore, it was found that interactions between students and instructors and between students cannot fully establish cognitive social presence and emotional social presence (Wut & Xu, 2021).

5. Conclusions

From the results of the survey and the testing of the research question and the individual questions of the questionnaire, some useful conclusions are drawn regarding the views and attitudes of HOU postgraduate students regarding the role of CT in e-GMT during the covid-19 period. These conclusions are coded as follows:

- Students' attitudes and opinions, both about the interaction (dialogue, participation, questions, etc.) between TC and students in e -GMTs and about the encouragement provided by the TC to the students, are positive. These findings demonstrate that in e-GMT the educational use of teleconference can create new possibilities and contribute significantly to the development of social skills of the participants, the cultivation of a spirit of cooperation and the active participation of the learners in the learning process (Armakolas, Panagiotakopoulos & Fragoulis, 2019)
- Students' attitudes and opinions about the TC's ability to differentiate its teaching taking into account students' interests and needs in teaching are positive. From these statements, it is clear that during e-GTM, it is necessary for the TC to plan and organize his/her teaching taking into account a number of pedagogical factors, such as the characteristics, experiences, needs and interests of the learners (Armakolas & Panagiotakopoulos, 2021; Hawkins et al., 2013; Joksimovic et al., 2015).
- A fairly high percentage of students state that alternative teaching techniques (brainstorming, concept mapping, etc.) and collaborative teaching methods (working groups, etc.) are used by the TC in e-GMT
- A high percentage of students state that during the e-GTM they develop critical thinking skills in teaching
- High percentage of students say it is feasible to replace face-to-face teaching with e-GTM
- Well over half of the students state that in the case of extended use of e-GTM, the sociability of students in teaching may be affected

Based on the above conclusions, the following question arises: "in e-GTM in the covid-19 period, is the role of TC positive or negative?". From the data of the present study, it is found that the role of TC in e-GTM had an overall positive impact on student satisfaction. It is worth noting that these data were derived from

questions based on the didactic and pedagogical dimension of teaching (interaction, collaborative teaching techniques and methods, working groups, etc.) rather than on how the technology was used.

In this context it is important for the TC to gain a critical understanding of the new realities shaped by the pandemic with the exclusive use of e-GMT in the educational process. More specifically, a reflective dialogical process is necessary on the part of the TC where he/she will seek to identify the new realities, to reveal the advantages and disadvantages of the use of e-GMT. At the same time, a key objective of the TC's utilization of the expertise of e-GMT is necessary to be a reflection and a reflection regarding the appropriateness of the teaching practices. The TC when using e-GMT needs to attach particular value to its pedagogical role and more specifically to the individual roles it encompasses related to support, communication, activation of learners and the development of collaborative learning.

In other words, the role of the TC in e-GMT is readjusted compared to face-to-face Group Tutorials Meetings as he/she is asked to overcome the obstacle of distance and lack of visual feedback from the trainees. In order to overcome these, it should utilize teaching techniques and methods that promote the active participation and collaboration of the trainees, such as working groups, dialogue, brainstorming, conceptual mapping, etc. (Armakolas, Panagiotakopoulos & Fragoulis, 2019; Berry, 2019; Coker, 2018; Martin et. al, 2019; Rose, 2018; Koustourakis, 2020; Koustourakis & Panagiotakopoulos, 2021; Valkanos, Papavassiliou - Alexiou & Fragoulis, 2009). As it follows from the data of the present study, these learner-centred and collaborative teaching techniques and methods are positively perceived by the learners during the e-GMT.

As an extension of the above, based on the attitudes and opinions of the graduate students in this study, in conjunction with similar literature (Koustourakis, 2020; Koustourakis & Panagiotakopoulos, 2021), it is found that with the tools available through teleconference, e-GMT are a modern strategy that allow the implementation of teaching options that put learners at the centre of the educational process through various techniques and methods, such as the particular personal written and oral communication between students, the separation of students into small groups ("collaboration rooms") and the existence of tools that allow students to work together to implement constructivist activities.

In this context, Open Universities that rely on distance education programmes, such as HOU, must continue to invest in open learning environments, adapted to the new data, as well as in the use of modern educational technologies such as teleconference calls for the implementation of e-GMT.

In conclusion, considering the data of the present study, a further research could be implemented with the participation of both students and lecturers from different undergraduate and postgraduate programs of HOU, which would investigate the impact of the teleconference system on the design and implementation of e-GMT.

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Teaching in the cloud: Navigating organizational, jugaad, and forced innovation pathways during COVID-19 pandemic

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Abstract

The emergence of COVID-19 disrupted the modus operandi of higher education institutes, leading them to adopt the innovation of digital education. The aim of this study was to examine how teachers and students navigated and shaped this transition through their practices and by initiating additional innovations. To meet this purpose, we drew on data from a sample of 22 higher education students and five teachers who experienced the transition from physical to digital education in two Greek higher education institutes in 2020. Following a semi-structured interview approach and conducting a thematic analysis, we identified three overarching themes. Our data tell that the transition to digital education was experienced as a forced innovation involving technological managerial and organizational elements and exploited through using of Jugaad practices, i.e., unstructured innovative practices that are developed based on the resources at hand and the competencies available.

Keywords: higher education, organizational innovation, jugaad, forced innovation, digital education.

1. Introduction

The emergence of COVID-19 in early 2020 led to an unprecedented crisis, disrupting many sectors of societal life, including higher education. Crises emerge from low-likelihood and high-risk events that interrupt the stability of a social system (Svensson, 1986) and are followed by hardly predicted but certainly damaging or even destroying impacts on different aspects of social and economic life (Lioutas and Charatsari, 2021). From previous experience, we know that when external crises occur, organizations have two choices: to remain loyal to their existing operating paradigms – hence putting at risk the quality of the services they offer and even compromising their own survival – or to innovate, thus exploiting new operating paradigms and opening-up new opportunity windows (O'Reilly and Tushman, 2004; Tushman and O'Reilly, 1996). Higher education institutes are not an exemption from that rule.

Nevertheless, the ways organizations – and individuals within them – innovate are not uniform. Different types of innovation emerge and are involved in the process of exploiting new operational paradigms. Innovations are, then, socially negotiated and potentially adapted within organizational settings, therefore changing shapes and forms, leading to new ways of doing and acting.

At that point, and before proceeding, it is essential to offer a brief conceptualization of innovation. Rogers (1983), in his very influential work, explains that innovation is an idea, practice, or object perceived as new by individuals or organizations. Social actors innovate – i.e., generate or adopt innovations – for various reasons, which can be classified into two main categories. The first one, includes innovations initiated to generate

impacts on the internal or external environment, leading to desirable changes (Damanpour, 1996). Innovations belonging to this category are, usually, based on a well-planned process (Pham et al., 2021). Indeed, organizations might spend long periods of time developing and implementing innovations that can solve their current or future problems and improve their performance (Vandenberghe, 1995). The second category is characterized by a degree of urgency: innovations emerge as responses to external changes, to which the organization is required to adapt its operating paradigm (Damanpour, 1996). The changes impelling innovation can be slow, associated, for example, with technological advancements or macro-economic factors, or rapid and steep, emerging from crises that directly affect organizations' ability to produce value (Clauss et al., 2022; Ebersberger and Kuckertz, 2021). In the latter case, on which the present study is focused, organizations may lack the necessary resources to make the most from innovation, and the innovation journey is highly uncertain. For organizations, understanding the paths through which crises-driven innovation processes evolve is pivotal for preparing themselves for future disruptions and external crises.

As more organizations did, higher education institutes lean upon innovation during the pandemic to navigate out of the storm. Universities and other tertiary education organizations were urged to adopt a new modus operandi and exploit the paradigm of digitally enabled education since governments imposed the closure of campuses to prevent the spread of the disease. Cloud-based peer-to-peer platforms were the only realistic options to continue the academic activities, and video-conference technological tools like Zoom, Webex, and Skype for Business served as spaces for offering lectures and performing remote examinations.

However, the adoption and use of online platforms was not a simple technological change because technology in and of itself represents a resource that cannot be exploited without being incorporated into the social practices of teaching and learning. Although technological artifacts put the basis for the necessary innovative shift, teaching and studying on these platforms cannot be explained as a unidimensional technological innovation. In the present study, following Orlikowski's (2010; 2007; 2000) work on socio-materiality, we argue that the technological innovation of teaching digitally cannot be separated from the practices of actors who perform it, namely teaching staff and students. Hence, we conceive the transition to digital education as a techno-organizational innovation, i.e., a technology-based innovation process (the material strand of innovation), which propelled the emergence of novel organizational practices within higher education institutes (the social strand). Such a view allows for a better understanding of the new words that the convergence of social and material (i.e., technological) practices associated with and performed during the transition to digital education created.

So far, we know little about these practices. Not surprisingly, higher education institutes' transition to digital education created abrupt changes in daily academic life (Ali, 2020), generating negative feelings for both students (Jiang et al., 2021; Aristovnik et al., 2020) and academic staff (de Oliveira et al., 2021; Karademir et al., 2020), and raising concerns about the quality of the services offered by universities (Gunawan et al., 2021; Masuku, 2021). The question of how to engage students in the new online education environment while, in parallel, keeping the quality of the offered courses high, become central for all academic institutes during the campuses' closure (Neuwirth et al., 2021). In parallel, the transition to digitally-enabled education exposed the lack of higher education institutes' preparedness to engage in radically new ways of teaching and learning (Rodrigues et al., 2021), owing to the gaps in online skills on the part of teachers, and their lack of course planning and implementing competencies under conditions that widely deviate from the normal; the difficulties of assessing students' performance when standard evaluation patterns are not operative (Toquero, 2020); and the absence of functional staff support systems and infrastructures (Watson et al., 2022).

To further understand how the practices of teachers and students shaped the transition to digital education, in the present work, we aim to investigate how they reacted to and made sense of the digital education innovation, dealt with the barriers that emerged, explored new opportunities, and adapted themselves and their styles to the new conditions. Plainly stated, we examine how their new worlds emerged and evolved after the initiation of a crisis-driven techno-organizational innovation shaped within the framework of teaching and studying practices.

2. Methods

2.1 Research design

To meet our research purpose, we followed a qualitative research design. Such an approach allowed us to gain deep insights into the issues of interest, build our analytical framework in an area where scientific knowledge is limited (Flick, 2022), and understand how teachers and students constructed the new realities while experiencing the synthetic worlds during the transition to digital education. In the first phase, we developed two semi-structured interview guides (for students and teachers) consisting of three sections referring to how they experienced the transition to digital education, their coping and/or adaptation strategies, and their perceptions of the innovations that followed and also guided this transition.

The questions were formulated so as to generate spontaneous and in-depth answers from participants, simultaneously promoting the dialogue during the interview (Kallio et al., 2016). After each question, we added explanatory "w-questions" as prompts (e.g.: Why do you say that? What do you mean? What about providing an example? Why do you believe this is so?) to collect data related to unforeseen issues (Kreiner and Mouritsen, 2005), and to uncover meaningful connections between phenomena or cause-effect relationships.

To evaluate the content and face validity of the guides, we invited two experts in higher education with more than five years of experience in conducting qualitative research to assess the following dimensions: the relevance to the research objectives, the degree to which questions are comprehensive, the appropriateness for the subjects, the proper wording, and the instrument's length. After some minor improvements and additions, the two guides took their final form.

After the first ten interviews, we performed an interim analysis to uncover concepts and issues that emerged during the process and could facilitate addressing the research questions. This way, we followed a reflexive iteration process (Srivastava and Hopwood, 2009), which allowed us to add new questions in the guides, thus shedding light on topics that deserve attention and validating the latent meaning of data.

2.2 Participants and procedure

To recruit participants, we adopted a snowball sampling process involving two university institutes operating in Greece. Institute A offers degrees in a range of disciplines, has a high position in international rankings, and has a long-term tradition in fields like medicine, humanities, engineering, and earth sciences. Institute B is relatively new and focuses mainly on technical disciplines, thus offering many laboratory courses. Teachers and students from both institutes were invited to participate in the study. Those who agreed to participate were asked after the interview to propose colleagues who could share their perceptions, thoughts, and experiences by taking part in the study. The process started on October 2021 when the physical classes re-opened in Greek universities and after a three-semester period of online lectures. We conducted 27 face-to-face interviews within a timeframe of two months.

Participants were five academics/teachers (two from university A and three from university B) and 22 students (nine from university A and 13 from university B). All the interviewed teachers had more than five years of

experience in tertiary education, while three of them were women. Their areas of expertise are presented in Table 1. Concerning the students' sample (Table 2), 13 participants were women (59%), while the mean age was 20.7 years (standard deviation=1.32). Their studying fields include "Earth Sciences" (n=4), "Humanities" (n=4), "Social Sciences" (n=4), "Physics, Chemistry or Mathematics" (n=4), "Engineering" (n=2), "Physical Education and Sport Sciences" (n=2), "Medicine" (n=2).

Table 1. Profile of interviewed teachers

Name	Years of experience	Area of expertise
Dominicos (he)	18	Earth sciences
Kiki (she)	21	Humanities
George (he)	8	PCM*
Eleni (she)	11	Social sciences
Evangelia (she)	5	Engineering

PCM: Physics, Mathematics, or Chemistry

Table 2. Profile of interviewed students

Name	Age	Field of study	Name	Age	Field of study
Dimitra (she)	19	Earth sciences	Antonis (he)	22	Engineering
Katerina (she)	20	Humanities	Savvas (he)	19	PCM*
Pavlos (he)	21	Social sciences	Theodora (she)	22	PESS**
Fanis (he)	19	Medicine	Stefanos (he)	21	Earth sciences
Nantia (she)	21	Social sciences	Stergios (he)	20	Social sciences
Alexis (he)	22	PCM*	Chara (she)	19	Humanities
Zoe (she)	20	Humanities	Vassilis (he)	23	Engineering
Thomas (he)	23	Medicine	Lina (she)	22	PESS**
Efi (she)	19	Humanities	Anastasia (she)	20	PCM*
Nikoleta (she)	20	Earth sciences	Christiana (she)	21	Earth sciences
Maria (she)	21	PCM*	Magda (she)	22	Social sciences

PCM: Physics, Mathematics, or Chemistry

** PESS: Physical Education and Sport Sciences

2.3 Data analysis techniques

To analyze data, we employed a thematic analysis. After the interviews, all data were transcribed, and we began the process of generating codes. Each one of the two authors independently created codes from the data sets in the interim and final analysis. In cases of disagreement about the coding scheme, the codes produced during interim analysis were evaluated against the original data by a third reviewer to ensure the validity of the analysis (Miles et al., 2014; Alhojailan, 2012). Then, we sorted codes into candidate themes (sub-themes), and after reviewing the coded data extracts for each theme and checking if themes represent the entire dataset, as suggested by Braun and Clarke (2006), we concluded with three overarching themes.

The first theme refers to the forced nature of the transition to digital education, which was considered a threatening innovation by some teachers because it was imposed without previous negotiation and exposed gaps in academics' digital teaching skills. The second one concerns the organizational dimension of the shift towards digital education, that is, the innovative organizational and managerial practices that accompanied

the use of digital educational platforms. The final theme is related to the creative micro-adaptations made and micro-innovations developed by teachers – and, sometimes, students – to enhance the quality of lectures in digital classes. We used the term "jugaad innovation" to label this theme. Jugaad innovation – from the Hindi word "jugaad" that describes an innovative fix – and refers to the process of initiating improvised solutions, generated through ingenuity and implemented by using the (limited) resources at hand (Prabhu and Jain, 2015; Radjou et al., 2012).

3. Results

3.1 Forced innovation: Innovating because it's the only solution

The first theme that emerged from our analysis refers to the forced nature of the transition to digital courses. Although all participants recognized that using online tools was inevitable, some emphasized the induced character of the transition to digital education and the lack of preparedness to cope with digital environments. Under such conditions, teachers felt uncomfortable lecturing from home and without the facilities traditionally used. As an interviewee noted:

"*Teaching without a whiteboard was very difficult. The job suddenly changed, and no one gave us any instruction on how to handle the new situation*" (George, PCM teacher).

From some academics' points of view, the opening of online classes was viewed as an unwelcome change that threatened their status quo. Others referred to the lack of free choice, which generated resistance to adopting the new way of teaching. As the following part of Kiki's (humanities teacher) interview indicates, there were academics who viewed the transition to digital platforms as a violation of their free will. The forced nature of change was accompanied by negative feelings, making the transition difficult or even problematic.

Kiki: *To have no alternatives is not democratic. Our institute just informed us that we had two days until starting to offer lectures by using a platform. I expressed my complaints to the head of our department, and he answered that it was the only way to continue teaching.*
Interviewer: *Wasn't it the only way?*
Kiki: *I don't know if other ways existed. Probably not. But nobody asked the staff if they wanted or could use online facilities. After all, teaching online is not a part of our job description.*

In some instances, the forced nature of the transition to digital education generated unwillingness on the part of teachers to adapt their way of teaching. Interviewed students noticed that some academics did not use PowerPoint presentations during online courses. As Magda (social sciences student) said:

"*Some teachers were not willing to share the presentations of their lectures. They preferred just to read parts from the coursebook. Such a style was not functional. It was difficult to follow the lecture*."

For Kiki, such a practice was considered a way to protect their intellectual work. *"It's a matter of intellectual properties,*" she said during the interview. "*I cannot share my presentation without knowing who can see it. In a digital class, you never know what your audience is.*" Indeed, the urgent nature of the transition to digital courses generated some gray zones regarding intellectual property rights and the responsibilities or obligations of teachers and students. However, the lack of skills on the part of academics also emerged from teachers' answers. As Dominicos, an academic with 18 years of teaching experience, put it:

"*It was a double shock for all. On the one hand, you had to cope with the uncertainty that followed the situation: a new virus threatening our and our students' lives. On the other hand, who was really ready to replace the*

physical class with a computer screen? Especially for those colleagues who didn't feel comfortable with technology."

Students also mentioned that the transition to digital classes was a challenging task beset by many difficulties. Nevertheless, they experienced the forced character of digital and remote education as a solution that could work at least as a second-best alternative. None of the interviewed students referred to the transition per se as a problem. However, from students' interviews was evident that the transition to digital education was not based on an efficient plan. As Stergios (social sciences student) explained: "*We just received an email stating that the lectures will be offered in an online platform. No more information was given. It was clear that teachers also had no information. The course was based on improvisation*."

3.2   Organizational innovation: Innovating – from necessity – to deal with transition

Although online education platforms are technological artifacts, the transition to digital education was not a pure technological innovation since it required some adaptations in the form of organizational and managerial innovation. Our data uncovered that some academics remained attached to a teacher-centered pedagogy, thus not allowing spaces for interaction between students and teachers or among students, as evidenced by the following quote.

 "*The course was tiring. The teacher was talking without asking us to share our thoughts and opinions. He continued doing what he did in the [physical] class, without caring about the new conditions*" (Nantia, social sciences student).

The "teaching as usual" approach was not functional in terms of students' engagement and delivering the expected learning outcomes. Ensuring the quality of digital lectures while teaching online was a predominant concern for teachers. Another hard-to-solve riddle was how to turn attendance into participation, impelling students to actively engage in the learning process. The need to change the structure of the lecture and initiate new knowledge co-production methods was found to be related to the nature of the course. For instance, in physical education and medicine faculties, where some courses are based on experiential learning strategies, the shift to digital education generated some fundamental difficulties. *"How to follow such a course from your computer screen? It's impossible! The course is by default practical,"* commented Fanis, a medicine student.

However, the transition to a new modus operandi for higher education institutes also overturned some well-established assumptions about teaching in higher education, leading teachers to enact new practices. "*When things fall apart, you have to reconsider your assumptions about teaching and see again your role as a teacher in a different setting,*" said Eleni (social sciences teacher) in her interview. Our analysis showed that finding a balance between some teachers' understanding of their role in the new context that the invasion of digital platforms shaped and their willingness to adapt their lecturing style to the demands of online teaching was not an easy task. As the following part of the interview highlights, teachers who did not change their pedagogical styles underperformed in digital classes.

Antonis (engineering student): *Some teachers did not even attempt to involve us [students] in the process. The lecture was an endless monologue.*
Interviewer: *Talking about those teachers, how was the situation in the physical classes before COVID-19?*
Antonis: *Well, some of them, if not all, performed better in the physical class. I believe that they probably felt like a fish out of water during the digital lectures.*

To cope with the new worlds that the forced digitalization of education created, most teachers started incorporating simple yet innovative practices into their teaching methodology. Innovation, in this vein, emerged out of necessity as a strategy to secure a high standard of teaching. The following passage from Evangelia's (engineering teacher) interview plainly exemplifies the felt need of teachers to introduce innovations related to the course organization and the management of the lectures.

"*When teaching in Zoom you cannot use the same practices as in the [physical] classroom. It is not a matter of digital skills. After all, most of the students are digitally skilled, and I must say that I also feel comfortable using online communication platforms. However, the distance makes things difficult. It is like having a wall between you and your students. You need to change your practices and your mindset to make things run. You keep the content as is, and you change its delivery techniques. What was more important for me during COVID-education was to find new ways to break the wall.*"

Although Evangelia used innovation to deal with the transition to digital education, some teachers saw this transition as an opportunity to innovate. Eleni (social sciences teacher) transformed her class into a hybrid learning space where academic knowledge met market actors' expertise. She organized a series of invited lectures by entrepreneurs from different European countries attempting to connect the university with the workplace and theory with the experience of practice, as she explained:

"*It was always in my plans, but it is difficult to find economic resources to support such an initiative. On the other hand, convincing an entrepreneur to spend a couple of days traveling here and offering a three-hours lecture is practically impossible. The online platforms open up new opportunities if you want to do something different.*"

All the interviewed teachers reported that they introduced a series of innovations to facilitate their teaching performance and promote students' participation in the lectures, or both. Notably, most of these innovative practices were built around participatory teaching techniques that promote student-oriented learning. Brainstorming and discussion sessions were used to enhance students' active participation in the lectures. Although these techniques are not new in the educational practice, students and teachers viewed them as innovative knowledge-creation methods because, in physical classes, teacher-centered approaches dominate, limiting students' involvement in the knowledge-construction process. Other, more demanding, and non-linear educational approaches, like role-playing and mind mapping, were mentioned by students of humanities and social sciences. What was common in these techniques was their ability to foster learning by providing new experiences and encouraging collective sense-making, as it is expressed in the following vivid quote:

"*During a course, the teacher asked us to read some texts and find their key messages. Then, each one of us had to write in the chat keywords summarizing these messages. She started to write them down on a PowerPoint slide. After that, we discussed how to group these keywords to create themes and started identifying the relationships among them and looking for cause-effect chains. Finally, we created a map based on our collaborative work. Very innovative and interesting experience, indeed! None of us left the meeting. We stayed for more than three hours*" (Lina, PESS student)*.*

Interestingly, our analysis revealed that some of the organizational innovations that the teachers introduced to the courses had positive side effects. For instance, dividing students into groups working in separate virtual rooms encouraged them to act as team members instead of individuals, promoting, in parallel, social capital development within the class. Other innovative practices based on peer-to-peer learning approaches

facilitated the building of soft skills not directly related to the object of the course by the students. In her interview, Christiana, an earth sciences student, described such innovation and its skills-building potential:

"A teacher asked us to prepare a short presentation referring to a part of the teaching material. Then, each student presented their work to the class, explaining concepts and terms and answering classmates' questions as a teacher does. Although it was demanding and a bit stressful, it was an opportunity to deepen into a topic. It also helped me to learn how to explain complicated terms, communicate with colleagues, and, most importantly, increase my self-confidence."

Teaching in virtual environments also led to the re-identification of the role that assignments can play in students' learning. Instead of being a supplementary tool for achieving learning outcomes, assignments took a central position in the educational activities, covering the major part of the teaching material and helping students develop writing skills and competencies in searching for and selecting the most appropriate sources, analyzing content, extracting meaning, synthesizing knowledge, and drawing conclusions. Innovative elements, referring either to the content of the assignment or to the writing process, were inserted by some teachers. For instance, a teacher assigned students to write a "fluid essay," which every week was enriched with new questions and supplementary data. Others created extra learning spaces by scheduling meetings between the lectures where students had the opportunity to discuss and reflect on issues related to the assignments.

3.3 Jugaad: Innovating "your way"

Although organizational innovations refer to the exploitation of the facilities offered by online platforms and/or the use of techniques that are or are considered innovative, our analysis uncovered another type of innovative practice enacted by teachers to improve the quality of their work. This category includes innovations involving the use of already existing tools that are freely available and easily adaptable to educational practice. Plainly stated, jugaad refers to the idea of combining teachers' improvisation and simple instruments – usually originally designed for other purposes – to produce positive educational outcomes. The analysis uncovered that jugaad arose from the necessity to keep students' interest alive and help them to build knowledge when other practices were ineffective. As George (PCM teacher) stated:

"It was really very difficult for students to follow the exercises through the online platform in real time. You know, some of them were eating during the lecture, exchanging messages, or even sleeping. I was trying to figure out how to address this issue, and I concluded that the best solution was to create a YouTube channel where I could upload exercises and solutions. I created it as a supporting tool. However, for some students, it was the main contact point with the course during the semester."

The interviews revealed that being easily accessible, popular, and enjoying the acceptance of students, YouTube was one of the tools that facilitated the development and exploitation of jugaad innovations. In one case, students were requested to produce content in the framework of an assignment. Efi's (humanities student) interview nicely exemplifies how some teachers, through the use of such tools, managed to promote learners' motivation to actively engage with the course.

"A teacher announced an assignment in which we had to prepare a clip and upload it to a channel that she had created on YouTube. She developed a list including several topics and invited us to select one of them. Then, we had to think about how to deal with the topic and produce a three-minute video. The whole experience was really creative. So fascinating. I developed a scenario, and my friends played some roles. Some other guys did better work, using animations and images taken by drones. We then, shared these videos on social media. I

have never felt so excited about a course. I almost could hear the motivation in the voices of my classmates during the online courses."

Other tools, like word clouds *("The teacher shared a link directing us to an application. We wrote words referring to the practices discussed in the course […]. The application generated a word cloud, and we analyzed it to draw conclusions. I don't think that a – how to say it? – traditional lecture could help us think in such a way"* - Vassilis, engineering student), polls ("*Voting about the ancient classics is not what you expect in such a course, but doing something new and then discussing its results is always interesting*" – Zoe, humanities student), or online games ("*It was one of those free online games, but it calculated the carbon footprint. Much better than just listening to a lecture, and, most importantly, a good opportunity to reflect*" – Nikoleta, earth sciences student), online quizzes conducted at the end of each lecture, virtual tours for presenting the architecture of monuments and buildings, or even TED talks were also exploited to motivate students and provide reflection opportunities.

Obviously, the high degree of improvisation incorporated in such innovations is followed by relatively high levels of uncertainty about their effectiveness. Hence, sometimes, the initiation of jugaad practices had not the expected results. Dimitra (earth sciences student) recalled relevant experiences:

"*I remember a TED talk, something about synthetic biology. The teacher copied some links and sent them through the chat. I guess he wanted to promote a group discussion on how technology can change the use of resources or something like that, but we ended up wrangling about COVID, with some stating that it is a hoax and things like that. Something went wrong.*"

The above-mentioned example indicates that the jugaad was far from an easy and safe way to promote educational objectives. Nevertheless, it opens up some new opportunities for using resources that can improve the quality of teaching and learning, including some shadow library projects, which students visited to download and share books. Interestingly, two interviewed students noted that such practices emerged during the online education period to secure access to sources "*necessary for performing well in the assignments*" yet "*impossible to be found off-campus*." Despite the many ethical and legal issues associated with the practice of using and sharing copyrighted material, and our disapproval of it, that practice represents another dimension of jugaad.

4. Discussion and conclusions

In this study, we aimed to shed light on how higher education institutes dealt with the transition to digital education during the first wave of the COVID-19 outbreak. In so doing, we also attempted to answer a new question that came to the fore after the experience of the pandemic. Are tertiary education organizations ready and capable of innovating when external disruptions occur? A rich tapestry of literature sources confirms that when external disruptions occur, organizations innovate to adapt themselves and their practices to the new ecosystems that emerge (Xiao et al., 2021; O'Reilly and Tushman, 2004). Our analysis revealed that higher education institutes followed the same route to survive.

The findings indicate that the pandemic mitigation measures experienced by teachers and, to a limited extent, students as a forced innovation, which is an unplanned process of innovation emerging as a response to unexpected events (Sharpe et al., 2019). As past research has shown, when innovation is imposed by external conditions, as in the case of COVID-19, the educational community might resist or not fully exploit innovative technologies (Ram and Jung, 1991). Some of our participants had the same reaction. Confirming Lemoine and

Richardson (2020), the findings suggest that the lack of previously developed plans for dealing with crises, and issues related to intellectual property rights, led teachers to underperform in digital classes.

Nevertheless, what seems more important to note is the lack of teachers' willingness or ability to adapt their lecturing style to the new conditions. For those teachers, the transition to digital education reduced the quality of the offered educational services. On the contrary, academics who complemented digitalization with organizational innovations managed to transform crisis into opportunity. Although relevant research rarely touched upon the issue of crisis-driven organizational innovation or views it through a macro-level (Kutieshat and Farmanesh, 2022; Thani et al., 2021), our results reveal that teacher-initiated in-class organizational changes increased the students' engagement in the courses and, consequently, their learning outcomes. Moreover, an important finding was that jugaad practices, involving simple technologies and developed through creative thinking and bricolage, helped teachers move beyond "teaching as usual" and produce positive educational outcomes. Given that in the forthcoming years is expected an increase in the use of online education platforms (van Puffelen et al., 2022), these practices deserve more research attention than previously awarded.

Before closing, we should mention a number of potential methodological limitations to the present study. First, our work is based on a limited sample in terms of students, teachers, and institutes included. Obviously, other institutes (located in Greece or other countries) had different levels of preparedness to cope with external crises and emergency plans. Second, the retrospective nature of data collection that we followed may lead to positively or negatively biased results (Charatsari, 2014). However, despite these limitations, our analysis has helped to further our understanding of how social practices catalyzed the transition of universities to digital education during the pandemic. The story told by our data suggests that this transition can be viewed as an externally imposed innovation, which had the potential to lead (and be led by) organizational and jugaad innovations. Through a broader spectrum, our work creates spaces for reflection on tertiary education organizations' capacity to innovate as a strategy to cope with crises and disruptions.

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Teaching on line art history and art terminology

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Abstract

The sudden transition to online teaching, due to the pandemic, has suddenly shifted the delivery of courses concerning history of the art and terminology. While, in the beginning, visits to museums and galleries were scheduled, the transition to on line teaching has raised questions about the effectiveness of the procedure, the changes not only to the delivery method but also to the material and interaction involving the tutor, the learners and the material. We will present the original approach in the pro-covid era and the approach adopted in order to guarantee the interaction in the learning process and the effective approach to the learning material. Data collected concerning the perception of the course by the students are a useful tool in order to evaluate the outcome and to perceive courses in a blended form that might be proven useful in the future.

Keywords: on line and distance education, art, history, interaction, blended learning

1. Introduction

Recently, the sudden transition to distance learning has diversified the sequence of activities, the duration of the session, the interaction between the teacher and the learners, the response to learners' questions. The lack of actual visual contact and interaction in the classroom deprived the teacher of the tools and indications necessary for the management of courses. We investigate the parameters effecting on line teaching in exchange art students who were in the same geographical area with the teacher but due to the pandemic could not visit art galleries and be in the university campus in order to attend a survey in Greek art and culture through time. The initial course concerning introduction to Greek art and culture was designed at a time that there was access to the university campus and art galleries where accessible to visit. The course began shortly after the covid-19 breakout but the initial session schedules included theoretical approaches through lectures, visits to the galleries and discussions concerning the art works and during the assessment presentation of individual or group work concerning comparative approaches to art and artistic production in different countries in relation to the course of Greek art and motifs through time. The course and the assessment were carried out on line. The initial findings indicate an approach to teaching art and civilisation on line without undermining the interaction concerning the material, the students and the tutor.

1.1 Learning environments

According to Dimitriadis (2003), the concept of interaction in a learning environment includes interaction with content (interactive environments, for example media, simulations), interaction with the teacher (for example email), interaction with other learners. Interaction parameters during distance learning will be examined to improve interaction in terms of content and engagement with the material provided to students.

The objective is to study the main observations in digital learning environments in higher education to bring about the necessary modifications or adjustments when blended learning might be used following the pandemic. The effective adjustments will define the final result of the learning, especially in cases where there is only hybrid learning, or the context is based exclusively on the digital learning environment.

Thanks to the observations of the tutor, the semi-directive interviews, the data concerning the performance of the art students, we analyse the initial impact in terms of interactivity, the participation of the learners in the courses and the overall performance. The transition towards digital forms of learning affects personal initiatives, interaction and learning outcomes. The analysis of the impact of digital learning environments as a unique learning environment can offer useful information to calibrate the educational framework in the coming years.

Distance learning has evolved through several stages from the use of correspondence in education to the use of print media, radio and television, the use of teleconferencing, computers and multimedia, to online learning, including Massive Open On line Courses (MOOC).

Transactional distance theory proposed by Moore (1973) links the concepts of autonomy, dialogue and learner structure based on J. Dewey's notion of teacher-student and teacher-student transactions. The sudden transition to distance learning has diversified the sequence of activities, the duration of the session, the interaction between the teacher and the learners, the management of questions from learners. Quite often, the lack of direct eye contact in distance learning deprives the teacher of the necessary indications for the management of the class.

2.1 Adult learners

Knowles formulated five hypotheses about the characteristics of adult learners (Knowles: 1984) relating to willingness to learn, the fact that many adults have reached a point where they see the value of education and are willing to be serious and focus on learning. They have practical reasons to learn, and adults seek practical, problem-focused approaches to learning. Many adults return to continuing education for specific practical reasons, such as entering a new field. In our case study learners were motivated in order to explore the multiple aspects of Greek art and its repercussion in other countries.

Closely related to adult learning is the notion of autonomy. Moore (1973) built the definition of autonomy on Carl Rogers' idea of learner autonomy, which was described as the learner has a plan for learning, finds resources to study, and evaluates by himself what he learns. He stated that the autonomous learner turns to teachers when he needs help in formulating his problems, gathering information, judging his progress, etc., temporarily giving up part of his learner autonomy.

To create vibrant communities, Downes (2012:371–372) identifies the key components of autonomy, diversity, openness and interactivity (or connectedness). Regarding autonomy, individuals make their own decisions about learning goals, choose their own learning resources, and decide on their own learning outcomes so that they can produce. Regarding interactivity, (connectivity), people in the network are connected and engage in dynamic interactions with each other; to produce complex and unique knowledge. This is very useful since the learners had the opportunity to interact to manage the obstacles.

During the pandemic audio-visual recordings were extremely helpful material to be used in the sessions. According to Jean -Marc Defays (2018: 307-308) the learners find them extremely helpful when it comes to reading comprehension, they also discover cultural elements and proxemics, posture, facial expression. It was extremely helpful to be able to follow the details in slow motion, to freeze the image in order to observe the details and focus on specific elements. There is definitely the danger of being carryout out be the sound and the image. In distance learning it was more imperative to choose short videos that could attract the attention through the content and the image.

Garrison and Anderson (2003) identified three elements that contribute to the development of the presence of teaching in online courses: the design and organization of teaching, the facilitation of learning and direct teaching, all of which deserve special attention. These three elements were taken into consideration when designing the outline of on-line courses for art students during the sudden transition to distance learning.

The first category, design and organization, cannot be overlooked in an online learning environment, especially when it comes to clarity and consistency of course organization and clear statements of goals and objectives. In addition, Bates (2015) argues that there are certain media that are particularly important for education. These include face-to-face human communication (e.g., classroom instruction), text, images/graphics, audio, video, computing (including animation, simulations and virtual reality) and social media. In your distance learning course, visual elements are extremely important since images, graphics, video were replacing the actual contact with art in an art gallery, bridging the gap.

Social media allow, among other things, access to rich conten,t available on the Internet at any time or anywhere (with an Internet connection), but also multimedia material generated by the learner. The material generated by the student at the end of the session was easily shared with the group and the teacher.

In this context, visual prompts were the main element that triggered the interaction with the content, the teacher and the group.

The concept of interaction covers interaction with the content, with the teacher and with other learners. Learners used the platform to carry out their tasks or communicate with their peers who had difficulty being present on the university campus. The platform has made it possible, in this case, to overcome the distance that separates students concerning the transmission and production of knowledge.

The design of a learning scenario, taking into consideration the individual characteristics of the students and their way of reacting to the proposed scenarios and taking into account their representations, can effectively guide the design of learning activities (Brassard & Daele, 2003) and guide learners in carrying out the activities. This would not only facilitate the support of students via the platform but also help them to use and effectively appropriate the tools made available to them. It is important to note that the individual characteristics of the students were taken into consideration as they presented themselves and the interests in the beginning of the sessions, but there was no physical presence during the whole course.

As it is noted by Jean Marc Mangiante (2011: 214) university lectures involve reading and writing skills as well as oral comprehension and oral production. In this framework, it was important to isolate the notions involved in the lecture and to combine them to the metaphors and reformulations, to identify the time and space that the lecture refers to. At a final stage the learner should be able to present the definitions, to present, to comment, to argument and to present his/her point of view concerning the taught subject.

During the first sessions the students participated by commenting on the material presented and rephrasing the main points. During the final session they were called to carry out comparative work by presenting similarities and differences through the use of specific vocabulary, terminology. The synthetic approach and the analysis were the core of the course.

1.3   The first findings

Through observation, semi-directive interviews, observation of student performance, we approach the initial impact in terms of interactivity, learner participation in courses and their overall performance. Distance learning seems to help students who work or have other obligations to participate in the course at a greater extent than

when physical presence is needed. The distances are abolised and there is the possibility of participating in the course. There was an increase in the attendance rates since it was easier to have access to the course.

On the other hand, the lack of personal contact and technical problems accentuate the lack of digital skills, especially for students who are less familiar with technology and are used to attending traditional art course.

During the first months of online teaching, the percentage of learners participating in the online course was higher compared to the participation rates in the traditional course on art history that was carried out in the university campus. We even notice a 40% increase at certain instance since there was no need to use public transport.

In addition, regarding performance and online interactivity, there was a strong participation especially in oral activities during the online course, probably because the virtual classroom offers favourable conditions. These are fairly complex findings, but even with regard to written production in the language class, there is a higher participation compared to the traditional class. Some students who were in the same location shared the same connection and these settings allowed only one of the students to speak on behalf of the group.

The learners interacted with the teacher, the other learners and the content of the course, but the animation provided by the teacher has a strong influence on participation and autonomy. There are strong fluctuations in the participation. It was noted that when the analysis of paintings presented strong similarities with the contemporary art work coming from the country of origin of the students, there was increased interaction. This is a new approach and the question of interactivity is closely linked to a series of parameters whose consequences and repercussions remain to be explored in depth, in the future, through the widespread use of online teaching.

2. Conclusions

History of art and culture are closely linked to visual prompts and it is difficult to substitute the emotions generated when visiting a gallery. However, the sudden transition was quite smooth since the galleries had released material on line.

The use of the platform allowed a simulation of a visit to a gallery without the transfer of the direct contact with the work of art. At the same time there was interaction with the tutor through the platform and asynchronous through email. The interaction between the learners was guaranteed through activities that were carried out in groups simulating the study in a classroom.

Audiovisual material was helpful but interaction and concentration was reduced when the duration of the video clip was long. The shorter the video clip, the easier to interact with the material and the fellow students. Since exploring art involves visual prompts and abstract notion, there are indications that shorter clips and division of activities in small parts increased interaction and mainly the comments of the students with the material. The first indications are useful when blended learning is scheduled in order to make sure that on line teaching is in pace with the classroom teaching.

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The Next Normal for Online Education:
Developing a Fit-for-Purpose Institutional Model

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Abstract

This year Dublin City University (DCU) celebrates its 40th anniversary of offering distance education. In 1982, the National Distance Education Centre was established at DCU to extend access to higher education to adult learners living throughout Ireland. In 2004, the National Centre became 'Oscail' in response to a new national funding model and to reflect DCU's transition to an online delivery model. Oscail is an Irish term that translates to Open Education. In 2014, 'DCU Connected' was launched as a major new initiative as the University sought to build on its long tradition of widening access to higher education as part of its core mission of 'transforming lives and societies'. At the time, the term 'connected' was intentionally chosen to shift the focus away from a particular mode of delivery to the transformative nature of the student learning experience – irrespective of geographical location. The intention was to encapsulate how learners in the new digital world can be connected wherever they study. Put another way, class can come to you! The connected metaphor was an effort to challenge the perception that online learning is by default an inferior mode of delivery compared to traditional forms of campus-based instruction and more recently the deficit language that became common in the COVID-19 discourse around Emergency Remote Teaching (EMT). Over the past 40 years, thousands of adult part-time learners throughout Ireland, and beyond, have obtained university qualifications through DCU's online distance education programmes. A strategic partnership with the FutureLearn platform has extended this outreach through an increasing range of short course offerings. In briefly reflecting on this history, this paper reports a significant new phrase in DCU's commitment to online distance education through the introduction of a stronger faculty-led delivery model. This latest chapter in DCU's history responds to increased capacity developed during the COVID-19 experience, which opens an important discussion about fit-for-purpose institutional models for online learning, especially at a time when many educators still regard the gold standard of higher education involving a campus-based experience. While the pandemic has been a watershed moment for online learning there are still many unresolved issues concerning scalable and sustainable delivery models, particularly in terms of the types of centralised supports, services and structures required to ensure that students who choose to learn at a distance have a fully connected learning experience. The key lesson from this latest DCU development is that despite continued growth in demand for flexible online learning, a significant challenge remains to fully embed new online delivery models in discipline and institutional cultures.

Keywords: online education, distance learning, business models, delivery models, institutional culture

The Times They Are A Changing: Transitioning a postgraduate programme from a dedicated distance education unit to an on campus faculty

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Abstract

In the past off-campus and on-campus programmes sat in separate silo's each serving different sectors. Even before the Covid19 pandemic, followed by the war in Ukraine, online learning was moving from the periphery of Higher Education towards the centre. This paper presents a case study analysis of one postgraduate programmes journey from a dedicated distance-learning unit to a mainstream business faculty.

Keywords: Online learning, Management of Operations, SWOT Analysis, Open Education, Managing Change

1. Introduction

This paper follows the journey of the postgraduate Master of Science in the Management of Operations programme, from the online-learning dedicated Open Education Unit, based in the National Institute for Digital Learning (NIDL) at Dublin City University, to Dublin City University Business School. It uses the SWOT Analysis Model (Andrews, Christensen, and Bower 1973) as a conceptual framework to map the management process undertaken in the journey.

1.1 Distance Education at DCU

Dublin City University (DCU) is a young university located in the northside of Dublin, in Ireland. Established as the National Institute for Higher Education, Dublin (NIHE) in 1975, it was elevated to university status in September 1989. DCU has a rich history of employing new educational technologies in its teaching, and of offering distance-learning programmes. The National Distance Education Centre (NDEC) started in 1982, linking Irish Higher Education Institutes in a collaboration to offer joint distance learning programmes, based in DCU. Growing from this foundation, the National Institute for Digital Learning (NIDL) began at Dublin City University in 2013.

1.2 Management of Operations Programme

The Master of Science in Management of Operations programme enrolled its first students in 1997 (Galvin et al. 2012). NDEC produced self-instructional texts for its programmes in hard copy and distributed them by post to students. The texts consisted of modules, written by academics in member institutions. In addition, face-to-face tutorials were offered to students at a number of study centres around Ireland (Foley 2021). Learners posted assignments back to tutors who provided detailed feedback and assessment. Annual exams were held in exam centres around Ireland face-to-face (ibid). Postgraduate programmes targeted graduates who were

seeking to upskill or reskill to advance their careers. Classes took place at night or at weekends to facilitate minimum work disruption. Students could self-pace their studies to complete a Graduate Certificate, a Graduate Diploma, or a Masters qualification. After 2003, all postgraduate programmes took place in an online-only format (Boyle, O'Keefe, and Walsh 2007). This strategy allowed increased flexibility, to provide 'second chance' education to adults and for the increasing number of the Irish workforce who required reskilling/upskilling and continued professional development (Delaney and Fox 2013).

1.3 Online Education moving from the periphery to the centre

The COVID-19 pandemic accelerated the next phase of DCU's commitment to online learning. The foresight and the organisational learning it had acquired, through presenting and managing Higher Education programmes online over many years, had positioned it favourably to provide a model of best practice nationally, and to contribute positively to the future of online learning internationally. In advance of the onset of COVID 19, DCU had decided to move online learning from a dedicated unit within the university, to its five constituent faculties, where hybrid teaching and fully online offerings were to become more mainstream. This was a strategic choice rather than a reaction to the global pandemic where:

> Nobody making the transition to online teaching under these circumstances will truly be designing to take full advantage of the affordances and possibilities of the online format (Hodges et al. 2020).

The first programme selected to pilot this transition at DCU was the successful Master of Science in Management of Operations programme, which moved to DCU Business School. This paper considers this strategic shift using SWOT Analysis (Strengths, Weaknesses, Opportunities, and Threats) as a framework to analyse the process. The resulting transition is a journey that may happen in other institutions in the aftermath the pandemic during which faculty were more exposed to online technologies , where off-campus and on-campus learning were heretofore delivered separately.

2. Strengths

2.1 Planning and Coordinating

Initial discussions took place at a high level involving the then Dean of the Business School and the Director of the National Institute for Digital Learning. A more detailed discussion took place involving the Business School Faculty Manager, the Business School Associate Dean of Teaching and Learning and a number of academic staff from the Open Education Unit and the Business School.

The transfer of modules was to be staggered into the Business School over a two-year transition period. A key member of the Open Education team transferred with the programme, maintaining distance learning and operational expertise. The new chair of the programme, an experienced academic in the Business School, had the responsibility to embed the programme into the DCU Business faculty.

2.2 Academics

Faculty based in-house academics have expertise, commitment, and are immersed in ongoing research in the field of Operations Management and are therefore cognisant with the most contemporary thinking in the field.The movement to online deliveryin response to COVID-19 , albeit emergency remote teaching, opened up faculty members of the Business School to online learning, in a way that they had not experienced in the past. The upside of this experience was that

> The transition process from face-to-face instruction to distance education is a major paradigm shift for faculty members. A study exploring faculty perception of the usefulness of distance education

programs (Gibson, Harris, and Colaric 2008) indicated a strong correlation between faculty acceptance of online programs and the perceived usefulness (Arenas, Gray, and Hamner 2009).

Tenured faculty members are part of a dedicated Operations Management group within the Business School. This enabled them to devise and design customised content to refresh and revise course modules, on a phased basis. In the past, the Open Education Unit relied on third-party academics to create content that in some cases was generic to all Postgraduate programmes, rather than focused content designed and created to fulfil module learning outcomes specific to the MSc in Management of Operations. These were delivered by outside tutors on short-term contracts, and consequently with short-term perspectives.

Figure 1: A Triangulated support approach (Covington, Petherbridge, and Warren 2005)

2.3 Teamwork

A strong team implemented the transition led by an experienced academic from the Business School. A graduate of the programme, who had taught on, and managed the programme over many years, moved to the Business School and supported the transition. A member of the Business School administration appointed to oversee administration tasks in the transfer of the programme from the Open Education Unit to the DCU Business School complemented the team. The approach taken mirrored the servant leadership approach:

Using the servant leadership components of listening, conceptualizing, and commitment to the group and the community, leaders can empower faculty to take ownership of the process (Arenas, Gray, and Hamner 2009).

The faculty did take ownership of the process and were committed to the successful implementation of the programme. This was one of the key success factors in the success of the transition. The process mirrored that implemented by North Carolina University when they transferred twenty programmes online. It captures concisely the areas of importance in moving online. They used "a triangulated support approach" stressing three areas of importance: administrative support, peer reassurance, and professional development opportunities (Covington, Petherbridge, and Warren 2005). The administrator dedicated to the programme, backed by the Assistant Faculty Manager, who provided assistance and oversight, gave administrative support. DCU has a Teaching Enhancement Unit (TEU), which provided Professional Development and Training particularly in the area of technology-enhanced learning. The Digital Learning Design Unit also gave assistance in giving online learning material and communication tools a fresh look and feel for students. The team based approach taken offered Peer Support, shared experiences and peer coaching.

2.4 Technology

DCU has a strong technology base to support online learners. A Moodle based Learning Management System (LMS) known as "Loop" houses course material, ePortfolio capability, asynchronous announcement and discussion forums, assignment drop boxes and student support materials. It incorporates anti-plagiarism software and an array of online resources including eBooks, online journals, and instructional resources provided by the library. A writing support centre and a maths-learning centre are among the services provided by student support and development at DCU. These both provide online and on campus support to students. The university Teaching Enhancement Unit, which assists lecturers in the design, and implementation of technology-based learning. In addition, the business faculty has an in-house learning technologist to assist faculty members.

2.5 Distance Learning Tradition

Distance learning commenced teaching at DCU in 1986 when the National Distance Education Centre (NDEC) offered its first undergraduate distance-learning programme, a BSc in Information Technology. The first NDEC postgraduate programme, an MSc in Management and Applications of IT in Accounting launched in 1990. This was followed by a BA in Humanities programme in 1993 which was accredited by six universities. The MSc in Management of Operations started in 1997 as did a Bachelor of Nursing Studies (BNS), in cooperation with An Bord Altranais (the Irish Nursing Board). The MSc in Internet Systems followed in 2001 (Galvin et al. 2012). Qualifications were accredited by DCU with no distinction from on-campus qualifications. All postgraduate courses went fully online in 2003 (Boyle, O'Keefe, and Walsh 2007). As these courses developed systems, processes, and procedures to manage distance learning evolved. A network of tutors skilled in distance learning developed, and DCU as an institution developed expertise in online and distance learning, becoming an active participant in European and World distance learning communities. DCU hosted the International Council for Distance and Open Education (ICDE) World Conference in late 2019, just before the pandemic hit.

3. Weaknesses

> Many traditional tenure-track faculty are new to online teaching and lack formal education in how to successfully teach online (Cutri and Mena 2020).

The shift in this transition was as much a cultural shift from one model of teaching, to a very different model, as it was a shift in the medium used to teach. While both units used part-time academics to guide learners, they used them in very different ways. The administrative support, teacher monitoring, quality control, expectations, and rewards given to tutors, were based on differing models. The absence of recognition that

this difference existed, and required adaptation represented a weakness in this transition. This section explores how this weakness presented.

3.1 Teaching

Moving an online model to a campus-based faculty highlights the issue of "fit". The Open education unit had a model of teaching built on the use of part-time tutors, typically very experienced in distance learning, who delivered a limited number of tutorials to guide and support self-directed learning. A network of asynchronous online forums, where student queries were resolved in a timely manner, supplemented these tutorials. These tutors were mainly working full-time in industry, and were supported strongly by very experienced, dedicated administration staff who carried out the clerical aspects of course management, student registration and support functions. The dedicated administration staff also prompted tutors to ensure student queries were addressed quickly. These supports were not transferred with the programme. The support that was provided for learners in the new situation was general student support not attuned to the needs of mature distance learners operating in isolation at a distance from the campus. Part-time lecturers in the Business School take total responsibility for the module they teach and typically teach face-to face to a weekly schedule, set and correct assessments and prepare learning materials. No special administration support is given to these part-time lecturers. Neither is any customised support given to part-time students, who have different needs to typical Business School pre- employment students. The two models were not the same and consequently mis-understandings occurred, and adjustments were required.

Five characteristics of innovation that explain differences in the rate of adoption of an innovation were identified by Rogers's relative advantage, they are compatibility, complexity, trialability, and observability (Rogers 1962). Three additional adoption constructs were identified by Moore and Benbasat, these are image (perceived to enhance one's image in this social system) voluntariness (adoption being of free will) and demonstrability (the ability to show results) (Moore and Benbasat 1991).

Table 1: Innovation Adoption Constructs applied to the Transitioning of the Management of Operations Programme

Relative Advantage	Not clearly apparent to faculty participants at the outset
Compatibility	The two teaching models differ considerably in their application
Complexity	Distance Learning was perceived as complex Because of the flexibility and choices offered
Trialabiity	The programme transfer had to be implemented without trial attempts. Existing students had to be afforded the opportunity to complete their degree
Observability	As distance programmes happen at a distance they are less observable
Image	The impact on image had the potential to be positive or negative
Voluntariness	Some participants had no choice but to participate in the move
Demonstrability	The ability to show results was highlighted by successfully adding a full time version of the programme at short notice when government funding was made available

We can see from Table 1 that the conditions for successful adoption of innovation as proposed by Rogers (1962), and Moore and Benbasat (1991) were largely not present or were not strong in this scenario. This represents a weakness in the case. Demonstrability was the exception as was highlighted by a quick pivot to add a full time version of the programme when government funding became available.

3.2 Communication
Communications breakdowns are often the result of one culture clashing with another. Organisations nearly always need a mix of cultures to carry out their tasks, but each culture must understand and respect the ways of the other (Handy 1996).

Universities consist of a network of departments all of which contribute to the effective management of the student journey through its life cycle. In order for each section to adapt its processes and procedures to perform sometimes unrecognised or undervalued tasks effectively, requires timely communication.

In this process, communicating changes to all departments impacted was poor. The responsibility for sharing information was assumed rather than allocated. As a result, many of the issues arising from merging two differently organised systems had to be resolved in a firefighting manner, rather than being anticipated, and addressed before they arose.

3.3 Registration and Structures
The flexible nature of distance learning customised to facilitate the requirements of off- campus, mature learners, had evolved at DCU to include multiple entry points, and a series of exit routes, pre-dating micro-credentials, but serving the same purpose. This resulted in a maze of structures and registration regulations far more complex than those applicable to on-campus, faculty-based students in the Business School. These structures were in need of rigorous examination, and streamlining. The process undertaken in this case was to adapt the Management of Operations programme structures, regulations and exit routes to match those of existing part-time programmes in the Business School. To take this approach while students who had signed up as Open Education students were still progressing through their qualification resulted in a sub-optimal experience for some students.

4. Opportunities

4.1 Substitution
Currently in Ireland there is a housing crisis (Hearne et al. 2018). The great recession during 2008-2010 led to a contraction in house building .This coupled with population growth, and the ongoing arrival of refugees fleeing Ukraine (approximitely 60,000 at the time of writing) has put massive pressure on housing available to students, with many commuting up to two hours a day to attend college.

Ever growing demand for higher education places further stress on existing bricks and mortar facilities, transportation systems, catering facilities etc. Using the option of hybrid or online classes for a growing percentage of previously campus-based students can alleviate some of the pressure on existing facilities.

4.2 Access
Online education opens up the possibility of higher education to people who would not otherwise have it available to them. To do this the EU commission has indicated that the focus should be on increasing fair access, participation and completion rates of under-represented and disadvantaged groups through relevant post-entry support and guidance, and promoting the civic and social responsibility of students and universities (European Commmission 2013). Key actions include providing support for Higher Education Institutions to

develop and implement institutional strategies for inclusion and study success. The Management of Operations Programme has done this in the past through providing access to refugees and underrepresented groups through schemes like DCU University of Sanctuary initiative, and the government back Springboard scheme co-funded by the European Union.

4.3 Diversity & Inclusion

Preparing people for the new economic models, can present the possibility of promoting diversity and inclusion, by using online learning to offer new opportunities. The political nature of education and the privilege it confers is directly responsible for how power is exercised in society. Jarvis (2004) argues, that those who control both economic institutions, and information technology increasingly drive power. Apple (2019) suggests that policy analysis needs to consider bigger questions about power and privilege.The central question is, how can education be provided, at what level, to whom and by whom? Gijsbers and van Schoonhoven (2012) raised these questions and argued that education must respond more flexibly to cultural diversity and changing labour market expectations. Widespread use of online learning opens up this possibility.

4.4 Internationalisation

New technology gives universities a medium to foster the new knowledge economy, and communicate its requirements, providing global opportunities. Many authors argue that universities occupy a special place and need to operate outside of the economic forces that drive commercial organisations, with the assistance of public support (Pister 1999), (Scott 1998). The emergence of for-profit universities and online providers in a neoliberal climate means that universities must ensure value in order to gain and retain that public support. The tension between this neo-liberal view and the traditional view of education is ongoing. Brown (2016) argues

> The HE system is made from a colour palette with conflicting ideological, epistemological and pedagogical assumptions. Although overly simplistic, at the root of these assumptions are two primary colours or basic worldviews: (i) the tradition of the Learning Society, and (ii) the influence of the Knowledge economy (Brown 2016).

While disparate interest groups apply pressures to compete for limited resources, and the demands on education are ever increasing, Brown argues that balancing conflicting demands requires consideration of a range of viewpoints anchored in these two core perspectives. Balancing these divergent stances takes place against a backdrop in which new models of distance learning are emerging, presenting new global opportunities. Co-operation and collaboration across geographical boundaries and time zones, is financially a much more viable option using online learning. Inviting international guests to contribute to discussions and lectures on virtual platforms like zoom, facilitates sharing international perspectives easily.

4.5 Sustainability

Once a niche concern, as global warming has an increasing impact on day-to-day activities throughout the world sustainability is now a central concern for all organisations. Reducing our carbon footprint and the use of finite resources is a concern for everyone. The option of presenting learning materials online, eradicating the use of paper in texts and assessments and the reduction in travel to and from college, makes the online learning environment a much more sustainable one. It advances UN Sustainability goal 4 to advance quality education and contributes to many of the other 17 sustainability goals.

4.5 Micro credentials

The use of exit routes off the MSc in Management of Operations at 30 ECT credits with a certificate, 60 ECT credits with a diploma and a Masters with 90 ECT credits, allows mature students the flexibility to scaffold their learning. The architecture of the programme built on 15-credit modules, which could be taken as individual professional development modules provides the possibility of offering these modules as micro credentials in the future.

5. Threats

5.1 Dilution

The MSc in Management of Operations Programme has had a strong identity over the last twenty-five years of its existence, targeting post experience learners who wish to enhance their skills. In line with best practice, this has been achieved by building on the prior learning and experience of candidates, building a community of learning and supporting students throughout their educational journey. A possible threat to its success as it becomes part of a part-time postgraduate suite in a large business faculty is that it loses its identity, its distinctive competence becoming just another offer in the portfolio of programmes.

5.2 Lack of Student Support

Distance learning students require a different type of support in their learning than campus based students. Bates (2019) calls this instructor presence. Indeed, there is a good deal of research that indicates that 'instructor presence' is associated with student success or failure in a course, at least in online learning (see, for instance, Shea et al, 2010). Where students feel the instructor is not present, both learner performance and completion rates decline. For such students, good, timely learner support is the difference between success and failure (Bates 2019). This additional support was provided by tutors experienced in supporting distance learners and by administration staff who provided rapid advice and encouragement to isolated students reducing anxiety. This expertise can be acquired by training and updating new staff and lecturers, but in the absence of the expertise currently, it represents a threat.

5.3 Loss of Funding

Since 2013, The Management of Operations Programme suite has received partial funding through the Springboard initiativ co-funded by the Irish Government and the EU. The programme partially funds the studies of job seekers, people returning to work and those in employment who wish to upskill. Over the lifetime of the initiative, the programme has been one of the most successful in terms of completion rates (85-90%) each year. In recent years, the first 30 credits of the MSc were funded providing a pipeline of students into the Masters. In the current academic year (2022/23) however, it did not receive funding. This represents a threat to the viability of the programme

5.4 Dismantling of Structures

The flexibility of entry and exit routes provided by the programme structures in the Open Education Unit gave learners a range of entry and exit possibilities to the programme. As it transferred to the Business School, the approach taken was to treat this suite of programmes in the same way as other part-time, postgraduate programmes in the faculty, leveraging synergies and gaining economies of scale.This approach gives students less choice and the threat this represents is that students could choose competitors with more flexible options or decide not to complete any programme

Table 2: SWOT Analysis MSc in Management of Operations Programme

Strengths	**Weaknesses**
Planning and Coordinating	Teaching
Academics	Communication
Teamwork	Registration & Structures
Technology	
Tradition	
Opportunities	**Threats**
Substitution	Dilution
Access	Student Support
Diversity & Inclusion	Funding
Internationalisation	Dismantling Structure
Sustainability	
Micro Credentials	

6.Conclusions

Change is never easy. The COVID-19 pandemic forced many universities to provide emergency remote instruction to fill the gap in the education of their students. This type of reaction did not equate to best practice online learning as evolved by course designers, learning technologists and distance learning practitioners over many decades. It did expose many previously reticent teachers to the possibilities presented by online learning. Ironically, the decision to move online learning from a dedicated unit in DCU to its five faculties had been taken before the pandemic struck. In this study, we have traced the path the postgraduate MSc in Management of Operations programme took as it moved from the Open Education Unit to the Business School in DCU. We saw how communications and different models of teaching provided challenges, while teamwork and the use of in house academic expertise provided positive advantages. Overall as a learning organisation, the University has learned lessons that can be used to make the most of future opportunities and mitigate the risks ahead.

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Using Google Trends to investigate distance-education-related searches in Greece since the COVID-19 outbreak

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Abstract

The spread of the SARS-CoV-2 in early 2020 has led to a global pandemic. The virus spread rapidly, leading to regimes of social distancing and isolation. The first quarter of 2020 saw an unprecedented global shutdown of educational institutions. In order for teaching and learning activities to continue, emergency distance learning programs were implemented. This study aims to investigate Greek public's interest in distance education during the pandemic using data of relevant searches through Google Trends (GT). More specifically, we (a) investigated the trending of the search terms 'ex apostaseos ekpaidefsi' (distance education), 'tilekpaidefsi' (tele-education) and 'distance education' during the COVID-19 pandemic in Greece, and (b) identified related searches. The results show that the popularity of 'ex apostaseos ekpaidefsi' and 'tilekpaidefsi' grew sharply in March 2020 and November 2020, while the popularity of 'tilekpaidefsi' grew sharply in January 2022 as well. Moreover, people searching for 'ex apostaseos ekpaidefsi' also searched for terms such as 'sygchroni ex apostaseos ekpaidefsi' (synchronous distance education) and 'EAP' (Hellenic Open University) while in the case of 'tilekpaidefsi' examples of related searches are 'sygchroni tilekpaidefsi' (synchronous tele-education) and 'asygchroni tilekpaidefsi' (asynchronous tele-education). The results are discussed in terms of the course of the pandemic and preventing measures taken in Greece during the last 2,5 years.

Keywords: distance education, tele-education, COVID-19, SARS-CoV-2, Google Trends.

1. Introduction

Coronavirus disease 2019 (COVID-19) was first described in December 2019 in Wuhan, China. A novel coronavirus, known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), was identified to be responsible for the disease (Rufaida et al., 2021). The spread of the new COVID-19 virus in early 2020 has led to a global pandemic: 374,927 deaths and 6 million cases of COVID-19 were reported worldwide as of June 1st, 2020, affecting 213 nations (Marson, 2020). By May 2021, there were approximately 170 million verified COVID-19 infections worldwide, and there had already been more than 3.3 million fatalities (Rosolanka et al., 2021). The virus spread rapidly, leading to regimes of social distancing and isolation. The pandemic disaster immediately sparked a variety of other crises, including an educational one (Grek & Landri, 2021).

Places where people interact frequently, such as schools, were closed down to lessen the likelihood that people would contract COVID-19 from one another (Bozkurt et al., 2020). The choice to close schools was not an easy one. Many individuals are mobilized for school events, including instructors, heads of schools, kids, parents,

and other personnel. While it soon became clear that COVID-19 was more harmful for adults (particularly for older age groups), school closures were seen to be one of the most effective ways to contain and prevent the disease (Grek & Landri, 2021). Thus, the first quarter of 2020 saw an unprecedented global shutdown of teaching and learning activities in educational institutions. Early reports from UNESCO estimated 290 million kids were not attending school, with the number of students affected reaching a peak of over 1.4 billion on April 24, 2020 (Mishra et al., 2021).

However, schools and universities were never entirely shut down since they could rely on digital infrastructures, platforms, and software for education. Distance learning and teaching were made available, and numerous emergency education programs were implemented. The digital transition was nearly instantaneous; in spite of the institutional collapse brought on by the pandemic, digital platforms established a safety net for the provision of emergency education. The abrupt digital switch was challenging for most countries and required an extraordinary effort to maintain the emergency instruction program. In order to provide quick fixes, schools and education administrators turned to any technology available, including internet platforms, applications, software, and digital material produced mostly by large corporations (Grek & Landri, 2021).

Taking into account the large-scale switch to online forms of education that followed the spread of SARS-CoV-2, we decided to gauge Greek public's interest in distance education during the pandemic. One way to estimate public's interest in a topic is through data associated with the digital footprint left by online activity (Blazquez & Domenech, 2018). Such data sources include social networking websites and search engines which both have been largely used in research in a wide range of research topics from health (Mavragani et al., 2018) or finance (Preis et al., 2013) to education (Martin et al., 2018). A popular data source providing information on online searches is Google Trends (GT). There is a number of studies that leverage GT to discover emerging patterns in public's interest during the coronavirus disease (COVID-19) pandemic concerning, for instance, dermatological conditions (Kutlu, 2020), plastic surgery (Dhanda et al., 2020), insomnia (Zitting et al., 2021), dietary supplements (Hamulka et al., 2021), spa therapy (Kardeş, 2021), pornography (Zattoni et al., 2021).

Considering the above, our study aims to investigate Greek public's interest in distance education during the pandemic using data of relevant searches through GT. More specifically, the research questions we address are:

i. How did searches related to distance education trend during the pandemic in Greece?
ii. What did users searching for distance education also searched?

2. Methods

To answer our research questions, we performed queries using the search terms 'ex apostaseos ekpaidefsi' (in Greek; distance education), 'tilekpaidefsi' (in Greek; tele-education) and 'distance education' (originally in English) setting the time range to the last 2,5 years (18/11/2019-18/5/2022). We note that we transliterated the Greek search terms to Latin characters for the needs of this paper according to ELOT 743 standard which is equivalent to ISO 843 standard. More specifically, to answer the first research question we performed three consecutive queries using one of the aforementioned terms at the time in order to identify related searches for each query. To answer our second research question, our initial intention was to perform a query comparing the three terms. However, since we received the information from GT that there were limited data concerning searches using the term 'distance education' we decided to perform a query comparing only the terms 'ex apostaseos ekpaidefsi' and 'tilekpaidefsi'.

We here provide a few information on GT in order to clarify the type of data it provides. GT https://trends.google.com/trends/ is an openly available tool that offers information on the number of searches conducted in Google Search. Relevant reports are available for any time period, from 2004 to present; users may even restrict these reports to focus on searches done within specific location or in a certain language. The so-called Search Volume Index (SVI) is the main GT output. SVI is an index that represents the fluctuation of the popularity of a given search along time. It is normalized in such way that the highest popularity is represented with an SVI value of 100. This normalization depends on the particular query to GT, meaning the particular search terms, period of time, language and location that was selected by user (Cebrián & Domenech, 2022).

3. Results

As shown in Figure 1, the results indicate that the popularity of both terms ('ex apostaseos ekpaidefsi' and 'tilekpaidefsi') grew sharply in March 2020, 'ex apostaseos' being slightly more popular than 'tilekpaidefsi'. In November 2020 both terms grew sharply again but this time 'tilekpaidefsi' was considerably more popular than 'ex apostaseos ekpaidefsi'. The popularity of 'tilekpaidefsi' grew sharply a third time in January 2022 but this was not the case for 'ex apostaseos ekpaidefsi'.
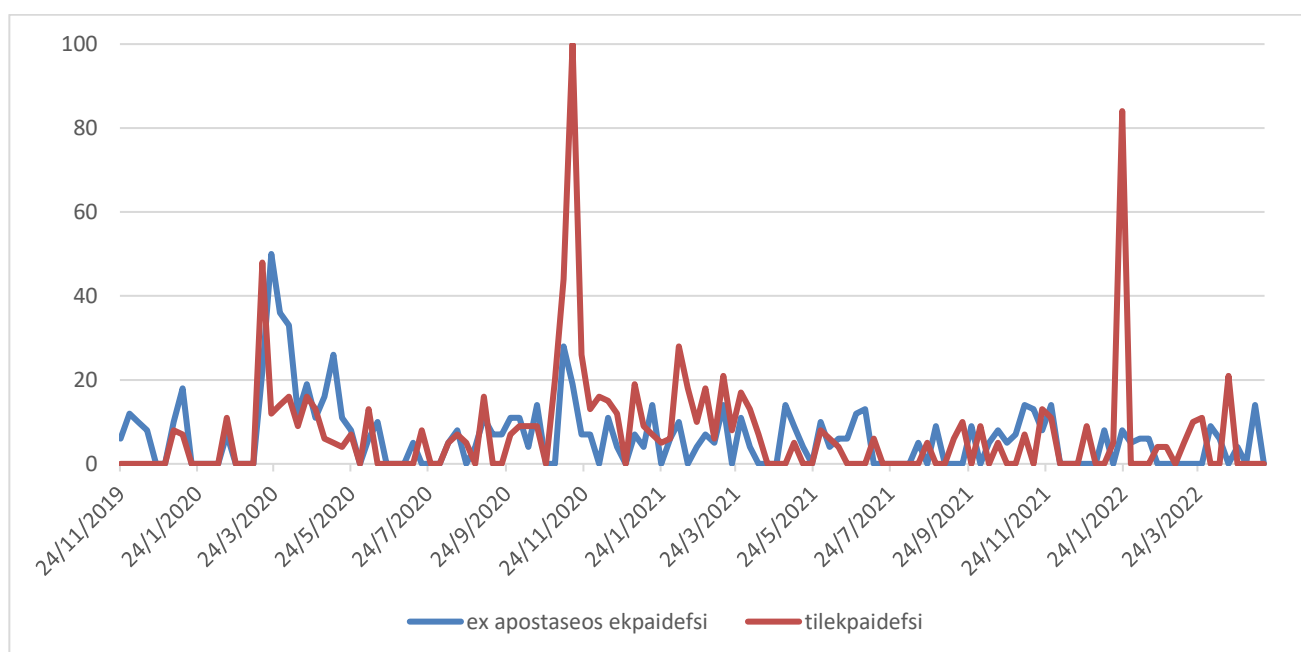
Figure 1: Search Volume Index with time for the search terms 'ex apostaseos ekpaidefsi' and 'tilekpaidefsi'.

The results show that people searching for 'ex apostaseos ekpaidefsi' also searched for terms such as 'sygchroni ex apostaseos ekpaidefsi' (in Greek; synchronous distance education), 'ex apostaseos ekpaidefsi dimotiko' (in Greek; distance education primary [school]) and 'EAP' (in Greek; abbreviation for the Hellenic Open University). In the case of 'tilekpaidefsi' examples of related searches are 'tilekpaidefsi dimotika' (in Greek; tele-education [in] primary [schools]), 'sygchroni tilekpaidefsi' (in Greek; synchronous tele-education)

and asygchroni tilekpaidefsi' (in Greek; asynchronous tele-education). Finally, GT did not provide related searches for the term 'distance education' due to lack of sufficient data. As with the original search terms, we transliterated the Greek related search terms to Latin characters for the needs of this paper according to ELOT 743 standard.

4. Conclusions

Investigating how searches related to distance education trended during the pandemic in Greece we noticed three peaks, namely in March 2020, in November 2020 and in January 2022. In an effort to explain this trend we may argue that the two first are connected with the application of emergency distance education because of schools' shutdown. More specifically, in March 2020 schools of all education levels closed as a measure to limit the spread of SARS-CoV-2 in Greece ("All schools will be closed for 14 days", 2020). Schools opened a few weeks before the summer break, then they closed for summer and students returned in September as every year. However, following an increase of COVID-19 cases, schools closed again in November 2020, secondary schools first ("Gymnasiums and high schools will be closed", 2020) and primary/nursery schools a few days later ("Primary schools and kindergartens will be closed", 2020). During the period that schools were shut down, there was an emergency instruction program applied based on video conference software, internet platforms, course management systems, various applications and digital materials (Kelesidis, 2022). Thus, we suggest that the two first peaks we noticed in GT data are associated with parents', students' and educators' interest on the emergency education programs that were implemented when schools were closed.

The third peak we noticed is also associated with closed schools but this time not as a measure to prevent the COVID-19 spread. More particularly, in January 2022 extreme weather events occurred in several locations throughout Greece which led to the closure of schools. The Ministry of Education and Religious Affairs decided that the schools that would remain closed due to weather conditions would adopt distance education as a way to not disrupt the continuity of teaching and learning (Trigka, 2022). We suggest that the third peak we noticed in GT data is associated with parents', students' and educators' interest on the emergency education programs that were decided to be applied in schools closed because of bad weather.

Moreover, we should note that the term 'tilekpaidefsi' is more popular than the term 'ex apostaseos ekpaidefsi' in Greece (for instance, a google search gives about 534,000 results for the former and about 316,000 for the latter). This may explain the fact that 'ex apostaseos' was only slightly more popular than 'tilekpaidefsi' in March 2020, tilekpaidefsi' was considerably more popular than 'ex apostaseos ekpaidefsi' in November 2020 and the peak of January 2022 concerns only the term 'tilekpaidefsi'.

Investigating what users searching for 'ex apostaseos ekpaidefsi' and 'tilekpaidefsi' also searched, we noticed that the type of education – whether synchronous or asynchronous – and the education level – primary school – were popular related searches. Distance education as it was implemented during the pandemic in Greece included both synchronous (such as videoconference software) and asynchronous (such as course management systems) applications (Kelesidis, 2022). We suggest that people who searched for 'ex apostaseos ekpaidefsi' or 'tilekpaidefsi' continued with more specific searches narrowing down the results through the type or the education level.

We acknowledge the limitations of our study that derive from the type of data we used. Due to the fact that the reports are produced from a sample of user searches, GT offers an accuracy problem. The sample methods used by Google are not disclosed, hence it is impossible to calculate the sampling error. Google acknowledges

that results may fluctuate by a few percent from day to day and it has been argued that this variation may be significant (Cebrián & Domenech, 2022). Finally, a coverage bias inherent in GT data should be considered. First, it only includes people who regularly access the Internet (Mellon, 2013). Second, GT can only gather data that were entered into Google Search, which may be the most popular search engine, however it is not the only way to perform relevant searches online (Cebrián & Domenech, 2022).

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Webcam use of students in online teaching and learning activities

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Abstract

While the use of webcams by students in online lectures is less evident, in small groups and breakout-room discussions the use of a webcam can be necessary to facilitate effective interaction. This study documents the main reasons that may act as barriers for students to actively use their webcam in online sessions in which interaction plays an essential role.

More than 260 students of three different study domains answered an online questionnaire, with items focusing on reasons for not using the webcam in interactive online meetings, on their opinion and feelings regarding webcam use and being in the picture, on their feelings about their own appearance, on their opinion about online teaching and learning, and on their experience with online teaching sessions and online oral communication in daily life.

More than half of the students don't like the use of webcam in lectures with large groups (for making a lecture more interactive). Most of the students state that it is good to use the webcam in small groups but more than a third mostly doesn't do this or even has a resistance in doing this. The most influential reasons for not using the webcam is the attention being drawn to their self and being in a messy room or feeling they look messy themselves. More than half of the students experience it as a problem to be in the picture.

Self-image consciousness seems to be a crucial element: more than 40% of the students are explicitly unhappy with how they look and more than 60% prefer not to look at the own image. So there is a general positive attitude towards online teaching and learning, but a number of students feel uncomfortable when webcams are involved as they might be implicated in interactive activity themselves. The study explores links with characteristics or contexts of their study programme, and tests relations with the level of experience with online communication in daily life, and with online learning in specific.

The findings are used to analyse the problem of engaging students to use webcams in (inter)active online sessions, and point out the need for supportive teaching strategies to overcome these issues.

Keywords: webcam use, online teaching, online learning, self-image consciousness.

1. Introduction

Rationale

Videoconferencing tools have been increasingly used in education worldwide. In many countries the COVID-19 pandemic necessitated online teaching and learning in compulsory education as well as in higher education. During the pandemic, in-person classroom instruction was intermittently placed on hold and university courses transitioned to online instruction, resulting in novel challenges for instructors, including reduced lecturer-student interactions due to limited student webcam usage. Although universities in Flanders were already well-equipped with audiovisual technology and a digital online learning platform, and although tools for video-based online meetings in the past years rapidly evolved to very user-friendly tools to be used in education, most universities lacked a clear and effective strategy for online teaching and learning, and a number of lecturers switched to online lecturing without adequate preparation or adequate skills. A recent study found that instructors with effective communication skills and teaching styles, a competent use of technology, and a supportive attitude, played a positive role in mitigating for the lack of preparedness in response to sudden migration online (Ahmed & Opoku, 2022).

In the course of two years pandemic, a substantial increase in professionalization took place in online teaching and in developing effective strategies. A recent study assessed the impact of a reinforcement contingency (by a statement on a daily quiz and a reminder on lecture slides) on students' use of webcams during synchronous online instruction (Lotfizadeh & Acosta, 2022). It demonstrated that it reliably increased webcam usage, suggesting that the students' behaviour of using webcams can change with a simple strategy. The general use of webcam in online courses, however, remains low. Because of the lack of interaction, university leaders in Flanders have put forward strategies to get students back on the campus instead of behind their computer screen. Another strategy could reside in trying to ensure that online teaching meets the demands of the students and also the requirements of effective teaching. This study focuses on the use of webcam in this respect.

Initiatives already have been taken to develop competency guidelines that may assist higher education leaders, lecturers and educational professionals in ensuring an appropriate level of competence to support learners while overcoming challenges linked to a technology-enriched environment. These guidelines are best based on research, as for example in a study (based on interviews with facilitators) on what is necessary for entry-level facilitators to demonstrate competence to adequately support learners in the synchronous learning environment, including technical/operational, classroom management, communication and design competencies (Phelps & Vlachopoulos, 2020). In such guidelines, attention is needed to the active use of webcams.

Synchronous teaching is being integrated in distance education, with web-conferencing allowing to interact in a shared real-time space. Despite assumed benefits of using webcams in synchronous online lessons, such as the feeling of co-presence or the possibilities of non-verbal communication, little is known about attitudes held by teachers and students towards webcams and their actual use. Findings of a study with a selected sample of 20 experienced online language tutors and 20 adult students suggested that most teachers and students only use webcams at the start of their lessons for socio-affective reasons and discontinue the use of webcams after a couple of weeks (Kozar, 2015). Some common reasons for reducing the use of webcams were, according to this study, the perception of online lecturing as more tiring, the feeling of self-consciousness, and privacy concerns.

In most online courses, and certainly in online lecturing in higher education, it is not mandatory for students to turn their webcams on during online classes. Teachers may complain about the anonymity of online lecturing, the lack of online feedback, and the risk of students adopting a passive attitude. Students may hide their faces during online classes for different reasons, and find ways to deal with the situation so that they can focus on learning effectively from their own point of view, which may be different from the educational strategy adopted by the lecturer. A survey study with more than 400 students highlighted that more than half of the students avoid to keep their webcams on during online classes, the main reasons being anxiety or fear of being exposed, shame or shyness, desire to ensure privacy of the home or personal space, and chances that other people might walk into the background (Gherges, Simon & Para, 2021). Finding and understanding the reasons for the avoidance of webcam use are necessary conditions for developing adequate strategies and undertaking regulatory interventions. Already in 2007 a survey of more than 1000 subjects found that more than 50% of adolescents at least occasionally used webcams during instant messaging but that for early and middle adolescents, greater levels of social anxiety reduced the use of webcams, whereas higher levels of private self-consciousness increased it (Peter, Valkenburg & Schouten, 2007).

Webcam use in online courses needs to be functional for both teachers and students, and also needs to be perceived as useful by both parties. The use of webcams by students in online lectures is less evident, especially in large groups, while in breakout-room discussions the use of a webcam can be necessary to facilitate effective interaction. Aspects of non-verbal communication are crucial components in live interactions. Blended and fully online synchronous teaching and learning should embrace all modes of communication, as this enriches the quality of student/teacher and student/student interaction. During the COVID-19 pandemic, teaching staff reported about difficulties in engaging students to use their webcam, and blogs indicate the need for useful strategies in this respect.

Research questions

For strategies to be effective, they need to take into account the underlying causes why students may have issues with using webcam in online meetings. Studies need to tap underlying motives in students, to learn how they can be overcome effectively in teaching & learning activities.

In this study we document the main reasons that may act as a barrier for students to actively use their webcam in online sessions that have an interactive character and in which interaction plays an essential role for the quality of teaching and learning. We link these factors to the characteristics of their study programme, the level of experience with online communication in daily life, and with online learning in specific. Also we link them to their opinion about online teaching and learning, indicating their educational awareness and their open-mindedness to the educational needs in online courses. Students that have an awareness of the functional role of multimodal communication in teaching and learning, may be more prone to spontaneously use their webcam in this setting.

The study tests whether there is a relation between the amount of experience with online teaching in which breakout rooms are used, and the proneness to switch on the webcam. It also inspects whether students who are prone to switch on the webcam have a more positive opinion about using webcam in online lecturing (as a way to make these sessions more interactive), and about webcam use in breakout rooms. A more positive view on the use of webcam in small groups is probably related to a willingness or preference to have more interactive online teaching, and probably also to the acceptance of using webcam also in larger groups to make these sessions more interactive.

2. Design and method

Target group

In this study, students from three different study programmes have been selected: teacher education (N=192), oral hygiene (N=122), and physiotherapy (N=319). The first two groups are professional bachelor programmes in a university college. The third group contains a mixture of students in academic programmes in a research-based university faculty of health sciences, following a bachelor programme (N=268) or a postgraduate programme (N=35). All students have followed at least one year of study. All students have followed online teaching in several courses in intermittent periods during the COVID pandemic in 2020 and 2021, and all have received an online course given by the same lecturer, in which interactive online methods were used. Apart from classic online lecturing, students in this course had online sessions with breakout rooms, in which students needed to discuss in small groups (n=5) on topics presented in plenary online sessions, and plenary online sessions in which some students randomly were selected to come forward per 4 to 6 and have a brief question-based interaction with the lecturer. This design ensures that participants in the study have a minimum amount of comparable experience in online teaching, and at the same time allows to explore variability according to subject characteristics as well as context of study programmes.

Method

The total number of students in the target group was 627. Students were invited to fill in a questionnaire via an announcement on the digital learning system ensuring anonymity in data collecting and reporting, as data were collected through the PROSE Online Digital System (www.prose.eu), not connected to the digital learning system. No questions were asked that could identify a student. The system prevents filling in the questionnaire more than once by an individual student. Students received only one invitation by an online announcement in Summer 2022.

The questionnaire included 7 items on reasons for not using the webcam in interactive online meetings, 4 items on opinion and feelings regarding webcam use and being in the picture, 4 items on feelings about their own appearance, 5 items on their opinion about online teaching and learning, and 5 items on their experience with online teaching sessions and online oral communication in daily life. All items of the first 4 sets were in the form of statements that had to be answered on a 5-point scale, ranging from 1 (not at all or disagree totally), over 2 (rather not agree), 3 (rather agree), and 4 (largely agree), to 5 (fully agree). For the questions about their participation in online teaching sessions and use of online oral communication, participants had to choose between 4 possible answers.

3. Findings

Response rate

The response rate across all study domains was high (42%). The response of students in the undergraduate programme of physiotherapy was the lowest (21%). This could be due to the fact that these students had clinical placements in this period, of which one third abroad. This was compensated by a high response by students in the postgraduate programme (Table 1). When collapsing both physiotherapy subgroups into one group, this resulted in three groups of students with comparable response numbers (resp. 100, 85, and 81), acceptable response rates (resp. 52%, 64%, and 27%), and representation within the total group (resp. 38%, 32%, and 31%). The participation of students of the teacher training programme is important, as they are the future actors in online teaching.

Table 1: Response rates in the different student groups participating in the study.

	Teacher training	Oral hygiene	Physiotherapy undergraduate	Physiotherapy postgraduate
N students in the programme	192	132	268	35
% of the target group	31%	20%	43%	6%
N students responded	100	85	56	25
% response rate	52%	64%	21%	71%
% of the response group	38%	32%	21%	9%

The questionnaire consisted of a set of 7 questions tapping reasons why students don't use the webcam in interactive online meetings, and 4 questions about their opinion and feelings regarding webcam use and being in the picture. All 266 respondents answered these two sets of questions. The number of registered responses per item varied between 259 and 261. So the minimal response rate within the group of respondents was above 97% for each item.

Additionally, in a later stage, three sets of questions were added to the survey, with 4 items tapping students' feelings about their own appearance, 5 items tapping their opinion about online teaching and learning, and 5 items tapping the frequency of participating in online teaching sessions and using online oral communication in daily life. 218 students answered these questions. All of them answered the questions regarding their participation in online teaching sessions and using online oral communication. The number of registered responses per item in the other two sets varied between 214 and 217. So the minimal response rate within the group of respondents was above 98% for each item.

Experience with online sessions and webcam use

90% of the respondents stated to have participated in at least 6 online live teaching sessions with a lecturer, and 75% stated to have participated in more than 10 sessions. 5% stated to have participated less than 3 sessions. All participants had at least one experience with live online teaching. Regarding the participation in small breakout groups (of 4 to 6 students) this cannot be stated. Almost a fifth of the students reported to have a minimum amount of experience limited to one or two sessions. When participating in an interactive online teaching sessions, students were given the choice of leaving the session when breakout rooms were organized. A number of students remained, but in these cases a number of students leave as their own choice or because the lecturer asks students only to participate when they have prepared for the discussion with peers on the basis of documentation or exercises (in a flipped-classroom design). The number of students having participated in at least 6 interactive breakout sessions in small groups is 57%, and 21% stated to have participated in more than 10 of such sessions.

All students answered a specific item on the use of webcam during breakout sessions, so we can infer that all students had at least one experience with this kind of interactive session in small groups. 43% of the students reported to use their webcam spontaneously in breakout rooms; 29% reported to do this when requested. 15% report they mostly don't switch on the webcam, and 13% only does this when the lecturer insists on doing this. So almost half of the students view webcam use as almost natural to do, while more than a third mostly doesn't do this or even has a resistance in doing this.

On the one hand, a minimum amount of experience is important for this study; but on the other hand the opinion of students who choose not to participate in a number of sessions is also important, as this study also focuses on underlying reasons regarding the use of webcam and the feelings of students in this regard. These

underlying reasons are not only important for students actively participating but also for students who choose not to participate. Not participating in online sessions can be seen as an avoidance strategy. As the number of students with a low degree of experience in this study remains limited to 5% for online teaching and 18% for breakout rooms, and as the focus is on online teaching without specification, they are kept in the analysis.

A background variable that may be of importance is the student's experience with oral communication using their smartphone, either by using their camera or by using direct speech or voice messages. The use of direct oral communication is, in contrast with the extensive use of written messages or chat, very limited. The pattern is quite the same for the two modes: voice only or speech and image. 20% of the students use these modes at least on a daily basis (with half of them using it more than once a day); 38 to 40% use it on a weekly basis, and more than 40% use it only rarely. So more than half of the students use visual communication with camera on at least on a weekly basis, with relatives and/or friends.

Reasons for not using the webcam in interactive online meetings

As 72% of the students mostly use their webcam spontaneously or when requested, and 28% don't do this or only when the teacher insists, it is important to find out for what reasons they choose not to do so or hesitate to do so. Students could answer these items independently from each other, as their personal reasons can consist of a combination of several possible causes. The items were formulated as "when I don't use the webcam, mostly this is due to". For this set of items, the extreme answering options on the 5-point scale were disregarded by combining scores 1 and 2 for negative answers and scores 4 and 5 for explicit positive answers.

As Figure 1 indicates, 70% state they dislike the use of webcam. More than 50% explicitly stated to dislike (largely or fully). More specific reasons were provided in 6 separate items. The most influential factor is the attention being drawn to their self by using the webcam. Indeed, in this case their image is displayed mostly in close-up as most online meeting software automatically remove the edges of their webcam image to focus on the facial area. The second top-level reason is the fact that students are in a messy room or feel they look messy themselves (e.g. in their clothing, hair dressing, facial make-up, or even in their position). As in most meeting software users are able to choose for a blurry or an alternative background image, the messy look of themselves probably is the most influential factor. More than 30% explicitly states this is the case.

Some students report that mostly they don't switch on the webcam because they are in a room where it is difficult to participate without disturbing others. More than 20% explicitly state that this is the case. In this situation, students frequently shut off the webcam and the microphone altogether and opt to follow by listening and reacting through chat. Students can also refrain from using the webcam when they are busy with other things and they prefer not to be seen while multitasking. More than 15% state that this is the case. Such other activities can be of a very different kind, from watching television to working on another assignment that has to be submitted on time.

Sometimes students say their webcam does not function properly. As reported in this study, where students could report anonymously, technical failure is only in 15% a problem, and in fact only 7% of these students report this as explicitly as a problem. Finally there can be cultural reasons (e.g. religious factors) or privacy issues which make that students prefer not to use their image. Viewing and displaying facial images is in some religions a matter of explicit debate or for which there are implicit rules, and students may also be worried about possible misuse of images. The number of students who see this as an issue, making them refrain from putting the webcam on, is restricted to 12%, and only 6% of these students report this as explicitly as a cause for their behaviour.
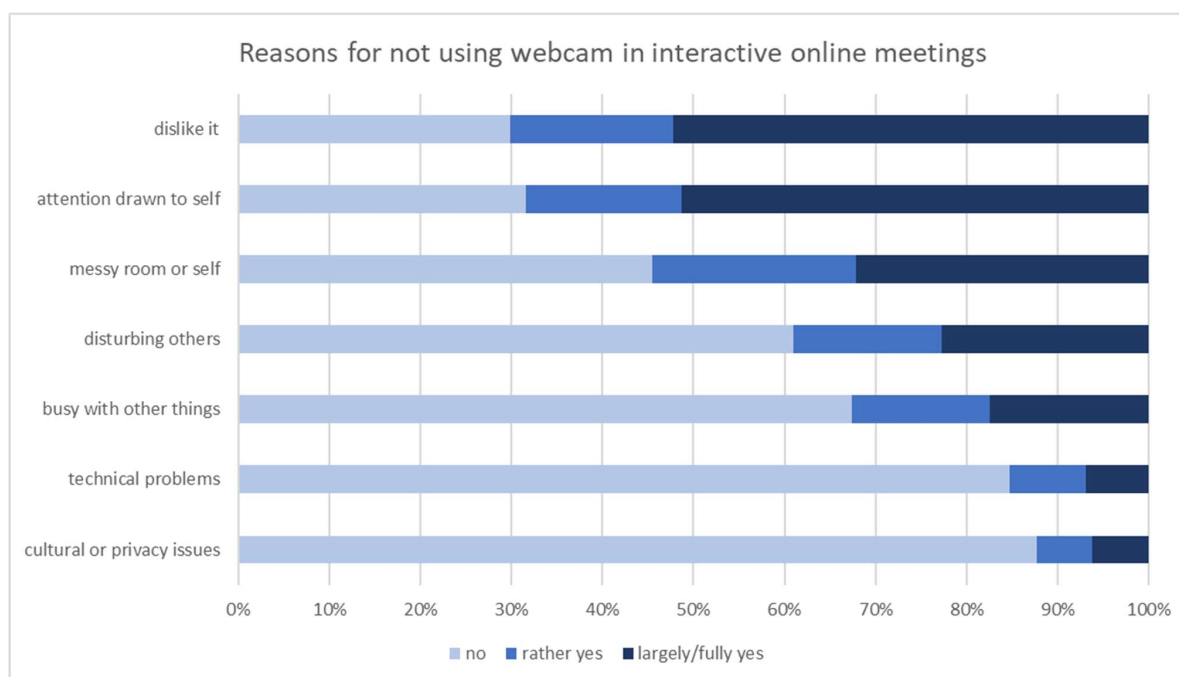
Figure 1: Reasons for not using webcam in interactive online meetings, as reported by students (N=266).
The extremes of the scale scores (1 and 2, and 4 and 5, respectively) are collapsed in this bar graph.

Do students from the different study programmes answer differently on these issues? To find out, a multivariate analysis of variance was conducted, using the scale scores (1-5) as dependent variables. A significant effect was found for the reporting of attention being drawn to the self (F=4.400, df=3, p<.01) and being busy with other things (F=5.608, df=3, p=.001). Students in the teacher training programme reported more technical failure as cause, and also being involved with other activities during the online teaching. Students in the postgraduate programme of physiotherapy report these much less as causes. These students may be more experienced and also more focused during the online activity.

Opinion and feelings about using the webcam and being in the picture

As the possible attention (of themselves and of viewers) being drawn to their image on screen is reported as the major cause for almost two thirds of the students, it is worthwhile to inspect this cause more closely (Figure 2). Most of the students (almost 80%) state that it is good to use the webcam in small groups. If asked whether it is a good way of working for a lecturer to ask some students in a large group to put on their webcam and come in the picture together with some other students, most students (55%) don't think so. Less than 20% explicitly see this as a good practice. More than half of the students (55%) experience it as a problem to be in the picture, and this raises to two thirds for being alone in the picture. So students feel more comfortable in using the webcam in small groups but not in large audience, even if it serves the purpose of making the lecture more interactive. Also in small group settings, however, a substantial number of students (more than 20%) disagree with the use of webcam.
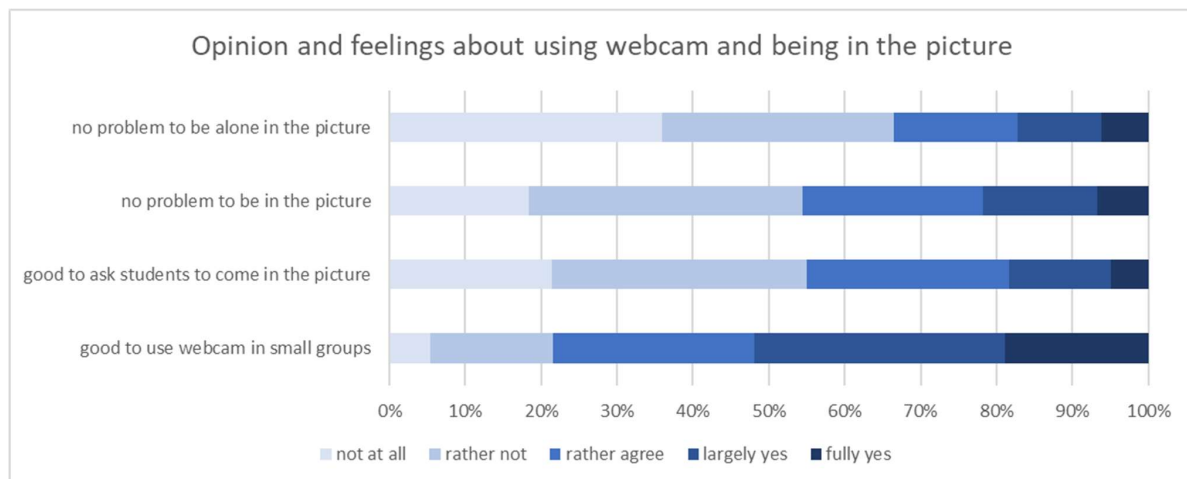
Figure 2: Students' opinion and feelings about using webcam and being in the picture in meetings (N=266).

To inspect this more closely, questions were asked about how students feel about their own appearance (Figure 3). 43% explicitly state to feel okay with the sound of their own voice or the way they look. For 30% of the students their visual look is not according to their standards (or what they perceive as a standard), and for 33% also their voice is not considered by them as good or pleasant to hear. Interestingly, more than half of the students worry in some way about their appearance. This can be the case even if they feel rather okay with how they look. Even more interestingly, 63% report experiencing problems to look at their own image. So more than 40% of the students is explicitly unhappy with how they look and more than 60% prefers not to look at the own image.
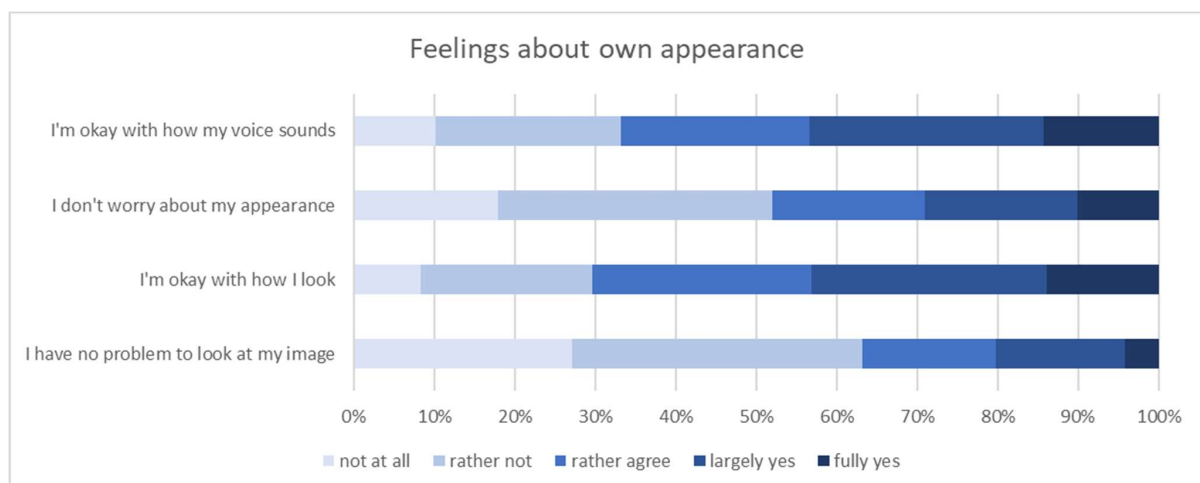
Figure 3: Students' feelings about their own appearance (N=218).

Interestingly, significant differences were found between students from the different study programmes with regard to being in the picture during online sessions (alone or with a few others) and with regard to being worried about the own appearance. Students in the teacher training programme experience lesser problems with this, while students in physiotherapy have more worries or concerns (for each variable $F>4$, $df=3$, $p<.01$).

Opinion about online teaching and learning

To be sure that the negative responses on some questions, and specifically the disliking of actively using the webcam by 70% of the students in interactive online meetings (although almost 80% state it is good to use webcam in small groups) is not based on a negative perception of online teaching as such, additional questions were asked about online teaching and learning (Figure 4). We know already that discontentment with and worries about the own appearance may cause students to refrain from using webcam. But maybe students may have objections that have to do with the method of online teaching and learning.
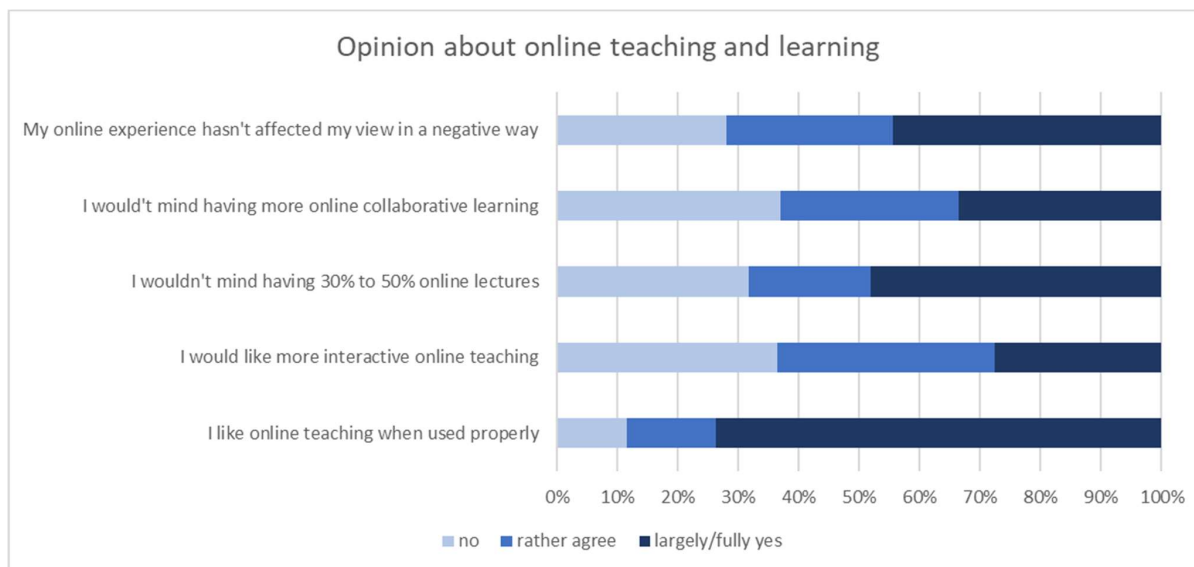
Figure 4: Students' opinions about online teaching and learning (N=218).

First of all, almost 90% of the students state they like online teaching when used properly. More than 70% wouldn't mind having 30% to 50% of the lectures online instead of on campus, and 60% even would like to have more interactive online teaching and online collaborative learning. In fact, more than 70% of the students state that the experience with online teaching in the past two years (which had to be implemented to a large extent due to COVID restrictions and frequently not in an adequate setting) has not affected their view in a negative way. So there is a general positive attitude towards online teaching and learning, and students see the advantages of it, but a number of students feel uneasy or concerned when webcams are involved as they might be implicated in interactive activity themselves.

Relation with in online teaching activities and online communication

Are students less engaged to use the webcam when they have a lower amount of experience in participation in online activities, when they are not in favour of having more interactive online teaching, when they don't see the use of webcam in online lectures (in which some students are being put in the picture) as a good strategy for making teaching more interactive, and when they have less experience in using camera-supported communication in daily life with their smartphone? To test this, correlations were calculated (using Spearman one-tailed testing, as variables were ordinal and not on scale level).

Significant correlations were found between on the one hand the amount of experience with online teaching in which breakout rooms are used, and on the other hand the proneness to switch on the webcam (.20, p=.001). It is conceivable that after having passed a threshold of experience, students may be more prone to switch on the webcam, but it is possible that students who don't like webcam use simply prefer not to participate in those online sessions.

Students who are prone to switch on the webcam have a more positive opinion about using webcam in online lecturing as a way to make these sessions more interactive (.22, p<.001), and certainly about webcam use in breakout rooms (.52, p<.001). These students also would like to have more interactive online teaching, although this correlation is only marginally significant (.15, p=.02).

The more positive students view the use of webcam in small groups, the more they would prefer to have more interactive online teaching (.39, p<.001) and the more positive they see the use of webcam also in larger groups to make these sessions more interactive (.38, p<.001).

At first sight there was no correlation between the experience with camera-based communication in daily life and the proneness to use the webcam in breakout rooms during online teaching sessions. Closer inspection, however, showed an intriguing u-shaped curve between the use of camera-based communication in daily life and several related measures of webcam-related opinions and feelings regarding online teaching (Figure 5). Students who frequently use the camera in their daily communication score clearly higher on these measures.
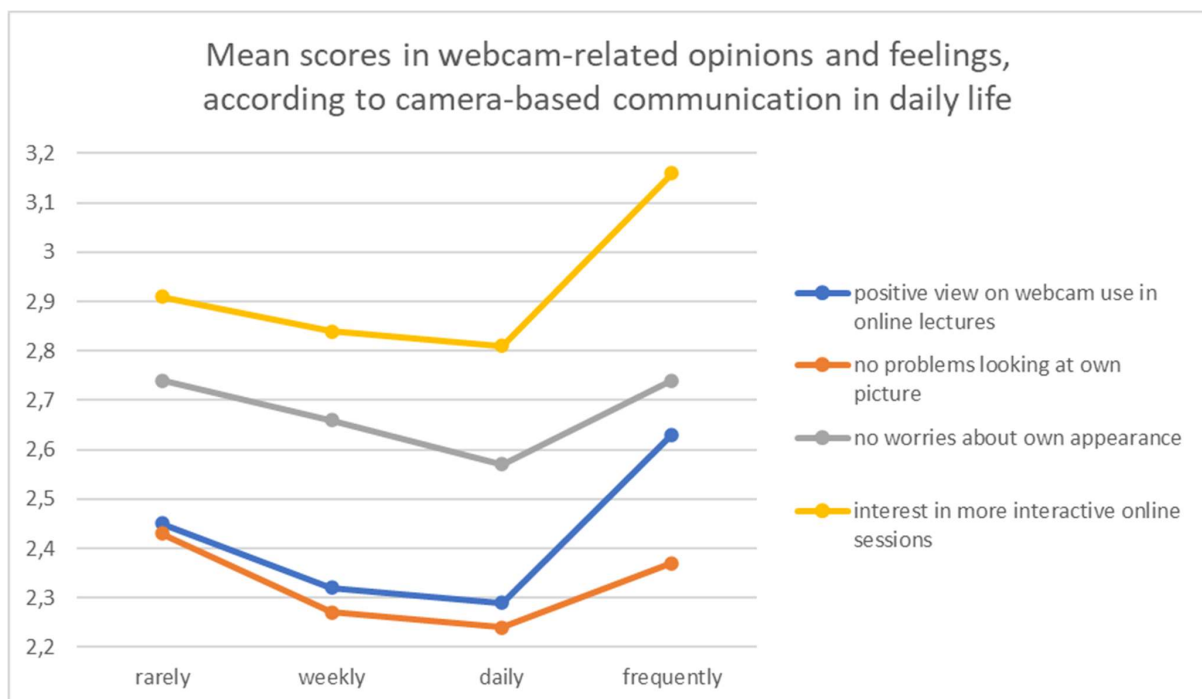
Figure 5: Relation between frequency of camera-based online communication in daily life of students and their opinions and feelings regarding webcam use in online teaching.

As measures or behavioural indicators are partly dependent on the distribution of scores, we can additionally check the balance by making subgroups based on binomial categorization (Table 2). The data show that among students there is a clear division in which two relatively balanced groups can be defined. Supportive online teaching strategies can increase the % of students on the positive end in the future. Regarding camera-supported communication, the frequency of use by students will probably increase and thus will also in the future positively influence webcam use for interactive purposes in online teaching sessions.

Table 2: Formation of subgroups based on students' opinions, feelings, and experience, and the distribution of students.

	N% negative	N% positive
Opinion on having more interactive online teaching: no vs. yes	37%	63%
Opinion on webcam use to make lectures more interactive: no vs. yes	55%	45%
Problems looking at own image: no vs. yes	37%	63%
Worries about own appearance: no vs. yes	48%	52%
Experience with breakout rooms up to 5 sessions vs. more than 5 sessions	43%	57%
Experience with camera-supported communication: rare vs. at least weekly	41%	59%

4. Conclusions

The findings of this study show that there is a problem of engaging students to use webcams in (inter)active online sessions. More than half of the students don't like the use of webcam in lectures with large groups, even if it serves the purpose of making the lecture more interactive. But students also dislike the use of webcams even in small groups, even if they agree that it is good to use webcams here for interactive purposes. In small groups, with interactive teaching or collaborative learning, almost a third of the students switch on their webcam spontaneously or when requested. As technical failure is reported to be very low (less than 10% report explicitly that this is mostly a problem), about a quarter of the students deal with other issues that cause visual disconnectedness. For online teaching this can be problematic, as good communication is essential in interactive sessions, and as a significant part of oral communication is based on nonverbal behaviour (especially facial expressions).

The problem of intentional visual disconnectedness in students is mainly based on feelings and worries of students regarding their own appearance. The context of the study programmes may influence the findings. For example, students in physiotherapy usually have lectures in large groups of almost 300, while students in teacher training have sessions in smaller groups of about 50. This can explain why physiotherapy students state having a bit more problems with being in the picture in an online teaching session. Students in teacher training have less problems looking at their own picture and have less worries about their own appearance. The job profile of these students consists of being in the picture and being in the centre of the attention in front of a class, and so they need to be self-confident in this respect. Educational staff can pay attention to student and programme characteristics when defining strategies for online teaching and for supporting students as well as teachers in these processes. This is important, as the findings point out the need for supportive teaching strategies to overcome issues related to webcam use.

Actively using the webcam in online meetings, and prompting students to interact and respond to questions posed, may be a strategy used by lecturers to stimulate students to reflect and to think, and to stimulate focused attention during online lecturing (as students may be picked out randomly). This study denotes that this may conflict with students' perceptions, needs and study routines. For example, students may be in bed while watching an online lecture, or may be busy with other things. Lecturers are faced with the choice to either (a) adapt their strategy to the preferences of the student, with most students preferring to listen and watch to a lecturer explaining things rather than to actively think and reflect on the basis of questions or intermediate reflective assignments, or to (b) adopt a clear strategy of actively stimulating students during online lecturing, and leaving the choice to the student of eventually not participating. A consistent supportive and stimulating strategy, and the growing use of online visual communication in daily life can motivate more students to choose to be visually connected in online interactive meetings.

Although most students agree that it is good to use webcams in small groups, more than a third mostly doesn't do this or even has a resistance in doing this, with 70% explicitly disliking it. This is a striking finding in a generation that is used to online visual communication with friends and relatives. Several reasons are used as excuses for not turning on the webcam in small groups. Very frequently, in communication with teachers asking to switch on the webcam, students report technical failure or being in a room where they would disturb others. Students may also be busy doing other things that may disturb or distract. In fact these are the minority of reported causes in this study, where students can report causes honestly. Students may use technical or contextual aspects as excuses for not using the webcam, while in fact other causes are more frequent. These causes have to do with the self of the student: the feeling of attention drawn to them and being in a messy setting or having a messy look. These factors can cause feelings of embarrassment or shame.

The present generation of students in higher education in 2020-2022 has grown up with Facebook and Instagram as daily input. Being active users of it, they were and are constantly prompted with pictures of friends and relatives displaying an image of feeling happy and being good-looking. This constant confrontation with beauty and happiness has a possible downside of gearing an exceptional focus on the self-image, which is already a concern in the process of identity development in adolescence and young adulthood. This form of raised self-consciousness, which I would like to call *self-image consciousness*, has implications on strategies of online teaching and learning, especially on synchronous activities in which interaction with teachers/lecturers and/or with peer students plays a major role.

As higher education will continuously evolve in the direction of incorporating online activities in blended study programmes or even deploying fully-fledged online programmes, institutions and programme committees need to reflect, preferably with students, on adequate and appropriate strategies that ensure effective teaching combined with active participation and wellbeing of students. Online teaching needs to take into account the underlying causes why students may have issues with using webcam in online meetings. Teaching staff should use strategies to overcome these issues by prompting students to actively use their webcam in sessions where this is necessary, and at the same time being aware of underlying barriers that are present in students. A strategy based on differentiation in activities, linked to experience and preference of students, needs to be complemented with an active strategy that induces the active use of webcams when this is appropriate, by stimulating educational awareness and calling upon motivation in students.

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Ethical considerations

No approval of an ethical committee was sought for this study, as all data were collected anonymously. Subjects were free to participate and were informed of all questions at the start of filling in the online questionnaire. The author declares no conflict of interest.

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Synchronous Hybrid Education

Synchronous Hybrid Education in Higher Education: Challenges and applications

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Abstract

This paper aims to present Synchronous Hybrid Education and how it can be implemented in higher education institutions, based on the new needs that have emerged due to the pandemic, but also on the new data arising from the socio-political changes of the 21st century. Synchronous Hybrid Education can be a basis for the redesign of courses and educational materials of higher education institutions, as its overall goals are to effectively integrate face-to-face education with online practices. Living in the era where technological innovation is at its peak and considering that speed and digital technologies are for most people an integral part of their daily lives, the need for the adoption of innovating learning by higher education becomes more understandable (Graham, 2006).

Many terms are used to define hybrid learning: hybrid, web-enhanced, mixed or blended, HOT (Here or There Teaching), multichannel learning model, dual model teaching/learning. Synchronous hybrid learning in the international literature is also found as synchronous blended learning, multiple access learning, Hyflex courses or simultaneous delivery of courses to on- and off-campus students.

Hybrid learning according to Hastie et al. (2010) combines the physical classroom with the virtual classroom, as a group of students attend class in the physical classroom and at the same time there are individual students attending remotely from the location of their choice. Hybrid or blended learning offers one such opportunity to provide engaging learning opportunities to students by combining face-to-face medium of instruction with online learning opportunities (Singh et al., 2021).

The research questions posed in this paper aim to study Synchronous Hybrid Education, define it, document the models that can be implemented, the instructional design choices to be made, the challenges and the pitfalls. Furthermore, using semi-structured interviews, the views of teachers and students on Synchronous Hybrid Education will be recorded, discussing the benefits as well as the challenges.

Oclott (2020) refers to the lack of logistical infrastructure, as universities to adopt either hybrid or distance learning need the necessary equipment. At the same time, the introversion of universities combined with the change in mindset from teacher-centred to learner-centred is a major challenge for conventional universities. Digital literacy and continuous training of lecturers is another equally important problem they must address. In addition, the lack of financial resources is expected to make it difficult for universities to secure the necessary funding. The expected outcomes of this paper are to identify the needs of higher education students and to define the scope of synchronous hybrid university education by examining the changes occurring at personal, interpersonal, socio-economic, political, cultural, and technological levels and the contribution of open and distance education to these changes.

Keywords: Synchronous Hybrid Education, blended/hybrid learning, new technologies, educational innovation.

1. Introduction

This study discusses Synchronous Hybrid Education in higher education by documenting the advantages and pitfalls that universities are going to face in case of its adoption. By Synchronous Hybrid Education, this study refers to the synchronous delivery of courses to both students attending the course face-to-face from the conventional university classroom and students attending the course remotely from the location of their choice. Synchronous Hybrid Education is a new form of education method for Greek higher education. The research hypothesis of this study is that if Synchronous Hybrid Education were adopted under certain conditions, it could create a flexible educational environment compared to the fully face-to-face teaching implemented so far. In order to achieve this aim, we studied the views of the teaching staff and graduate students of the Interdepartmental Master's Degree Programme "Educational Leadership" of the University of Patras. The results revealed a cautious optimism about Synchronous Hybrid Education, as it can offer an innovative and flexible system, which however, has to be designed with sound pedagogical principles in order to be able to address the numerous challenges presented by Synchronous Hybrid Education.

This research addresses Synchronous Hybrid Education by documenting the advantages and challenges that will be faced by both face-to-face and distance learners, teaching staff and educational institutions themselves. Through the literature review, proposals are recorded to address the challenges faced by Synchronous Hybrid Education environments, analysing the technological design, the logistical equipment, and the communication. The research concludes with a listing of key design principles for Synchronous Hybrid Education. The results of the interviews with students and teaching staff of the postgraduate programme "Educational Leadership" of the University of Patras, which is implemented in the Synchronous Hybrid way, are discussed. Moreover, the methodological approach used to conduct the interviews is analysed. The findings of the research are then presented through a discussion of the data obtained from the semi-structured interviews.

1.1 Objectives of the study and research questions

This study aims to discuss Synchronous Hybrid Education and how it can be implemented by Greek conventional universities, based on the new needs that emerged due to the pandemic for the continuation of university education, but also on the new data arising from the socio-political changes of the 21st century.

The objectives of this study are to study the advantages and challenges of the adoption of Synchronous Hybrid Education by higher education, and also to record proposals for the adoption of Synchronous Hybrid Education by higher education.

The above objectives were transformed for the needs of this study into the following research questions:

- What are the advantages of implementing Synchronous Hybrid Education in higher education?
- What challenges do both higher education institutions, teaching staff, and students face in adopting Synchronous Hybrid Education?
- How can Synchronous Hybrid Education be designed and adopted by universities?

1.2 Methodology

The present research adopts the principles of qualitative methodological approach, as it aims to collect, analyse and interpret data, arising from the literature review of both international and domestic literature, combined with semi-structured interviews, in order to explore the concept of hybrid learning in higher education. This is an analysis and interpretation of non-numerical data, which makes this research qualitative in nature (Mills, Gay, & Airasian, 2017:22). The views of faculty and students on Synchronous Hybrid Education were recorded, discussing the benefits as well as the challenges. The participants in this research are the

teaching staff and postgraduate students of the Interdepartmental Master's programme "Educational Leadership" at the University of Patras.

The limitations that arose for the implementation of this research are mainly related to our sample, as the target population comes only from the University of Patras. The validity and reliability of this study is ensured by the qualitative selection of the interview participants, as their experience of participating in a hybrid curriculum will contribute significantly to the understanding of the topic under study (Mills et al., 2017:158).

2. Basic concepts of distance education

In recent times and because of the special circumstances that arose due to the Covid-19 pandemic, all levels of education in the first year of the pandemic, in order to be able to continue their operation, adopted distance education. As for higher education, distance education was adopted only in the first year of the pandemic, while in the second year the Ministry of Education proposed that all university institutions should continue their operation with the Synchronous Hybrid mode of education, in the sense studied in this paper.

Distance education is therefore defined as "education that teaches and enables the students how to learn on their own and how to function autonomously towards a stimulating self-learning path" (Lionarakis, 2001). "Blended learning has been referred to as the 'third generation' (Phipps & Merisotis, 1999, p. 26) of distance education systems. The first generation was correspondence education which used an one-way instructional delivery method, including mail, radio, and television. The second generation was distance education with single technology, such as computer-based or web-based learning. The third generation is blended learning, characterized as maximizing the best advantages of face-to-face learning and multiple technologies to deliver learning. Generally, blended learning means any combination of learning delivery methods, including most often face-to-face instruction with asynchronous and/or synchronous computer technologies. Hybrid learning is another term which has been used synonymously with blended learning" (So & Brush, 2008:321).

Learning initially took place in a traditional environment, where the instructor interacted face-to-face with the learner in a lively and modern environment, that of the traditional classroom. In contrast, distance learning systems placed greater emphasis on interaction, self-paced learning and instructional materials (Graham, 2006:4).

Distance learning is currently the fastest growing form of education. What was once considered a special form of education that used non-traditional delivery systems is now becoming an important concept in current education. Concepts such as networked learning, connected learning spaces, flexible learning and hybrid learning systems have expanded the scope and changed the nature of previous distance learning models. Distance learning presents significant benefits for education, both in terms of its sustainability (Akinbadewa & Sofowora, 2020) and cost reduction (Al-Husban, 2020).

In distance education, technology plays an important role, which helps to facilitate communication between trainers and learners, as there is a physical distance between them (Garrison & Shale, 1987:12). Technological innovation nowadays is at its peak, speed and digital technologies are for most people an integral part of their daily lives (Graham, 2006:5). Technology has impacted all areas of human life, inevitably affecting education. With its emergence and utilization by education, learning, according to Raja & Nagasubramani (2018:33), has improved, while also increasing the interactivity of students.

Basic concepts related to distance education are distance, independence and interaction. The use of technology, as well as various media such as video, audio, graphics and virtual reality, has enriched the content

of educational materials, contributing to the independence of learning and better understanding (Moore & Anderson, 2003:55). With the basic parameter of the space and time where the trainer and the trainee are located, communication can be implemented either synchronously or asynchronously, or by combining both ways.

By synchronous communication we mean communication that is implemented between the trainer and the trainee at the same time whether or not they are in the same place. In contrast, asynchronous communication between the instructor and the learner is realized when they are in different time and space (Miller & Padgett, 1998).

Technology facilitated the interaction of learners (Hashim, 2018:3). Learners and trainees communicate with the help of social media (Facebook, Twitter, Myspace, LinkedIn, etc.) and also with the help of forums. They are very familiar with the use of social media in their everyday life and therefore it is easier for them to integrate them into their studies, turning "social networking" into "educational networking".

Computer-based technologies are changing rapidly and becoming increasingly complex. Smart devices and Internet access allow learners and trainees to acquire real and procedural knowledge about many things anywhere and anytime. These computer-based technologies, if properly harnessed to support learning, can promote important pedagogies such as promoting personalised and collaborative learning. However, new technologies create a burden on designers and educators to use them effectively to support learning and instruction (Liu, Spector & Liulkle, 2018).

E-learning, according to Garrison (2016), refers to the use of synchronous and asynchronous communication via the internet for collaborative learning. In recent years, due to socio-economic changes and the rapid development of technology and the Internet, e-learning has become even more established in the educational system (Garrison & Anderson, 2017). E-learning according to Garrison & Kanuka (2004:97) includes three categories: the enhanced classroom, blended learning and the fully online learning experience.

3. Synchronous Hybrid Education

Moving into the 21st century, in which access to innovative communication tools is improving and increasing, the boundaries between traditional face-to-face education models and online education models (e.g. MOOCs) have changed, making room for new synchronous hybrid or blended approaches (Zydney, McKimm, Lindberg, & Schmidt, 2019:124). At the same time, more and more academic institutions internationally are investing in technology and creating technology-enhanced learning spaces with the aim of creating innovative and effective learning environments (Raes, Detienne, Windey, & Depaepe, 2020:269).

The first study therefore on Synchronous Hybrid Education dates back to 2003 and it is a study that examined the quality and quantity of communication and interaction between teaching staff, on-site students and students who were simultaneously attending the course at a distance (Rasmussen, 2003).

There are several definitions in the international literature to define and describe Synchronous Hybrid Education such as:

- Synchronous hybrid learning (Rasmussen, 2003)
- Synchromodal learning (Bell et al., 2014)
- Blended synchronous learning (Szeto, 2015)
- HyFlex course design (Abdelmalak & Parra, 2016)
- Hybrid synchronous instruction (Romero-Hall & Rocha Vicentini, 2017)

- Here or There (HOT) instruction (Zydney et al., 2019)
- Fusion classroom (Amarin, 2020)
- Multichannel learning model (Ningsih, et al. 2021)
- Synchronous hybrid teaching (Bülow, 2022)

Hybrid learning according to Hastie, Hung, Chen & Kinshu (2010:9) combines the physical classroom with the virtual classroom, as a group of learners attend the lesson in the physical classroom and at the same time there are students who attend remotely from the location of their choice.

Since 2010, a university programme based on the hybrid Global Classroom model has been implemented in Denmark as part of adult education. In this model the teaching staff and some students are present on campus in the classroom, while other people participate simultaneously from home using laptops (Weitze, Ørngreen & Levinsen, 2013:215). Global Classrooms (Figure 1), as the classrooms used for adult education are called, use videoconferencing equipment that allows the teaching staff and students on campus to view and communicate synchronously with the students in their homes and vice versa (Weitze et al., 2013:216).

Figure 1: Global Classroom (Weitze et al., 2013:2016).

3.1 Synchronous Hybrid Education challenges and pitfalls in online environment

Communication technologies play a key role in Synchronous Hybrid Education. One of the primary technologies used in Synchronous Hybrid Education is videoconferencing, which has brought together on-site learners and online learners through the implementation of shared and collaborative learning experiences for both face-to-face and online participants in real time (Cain, et al., 2016:116).

Synchronous Hybrid Education can offer many opportunities for teaching staff to deliver effective and quality learning. The synchronous hybrid mode of education allows teaching staff to differentiate instruction to meet the different learning needs of the students (Abdelmalak & Parra, 2016:19).

Online and face-to-face students can get together in discussion groups and complete collaborative learning activities (Bower, Dalgarno, Kennedy, Lee, & Kenney, 2015:14). At the same time, the isolation of online students is significantly reduced, as they can see and get to know face-to-face students much better than if they were attending asynchronous classes (Cunningham, 2014:37). Online students enhance their social presence as they can and do communicate in real time, and also have better completion rates than individuals from the student population who rely solely on asynchronous communication (Bower et al., 2015:14).

Synchronous hybrid courses offer greater accessibility and flexibility in course attendance, which is particularly important for those who live far from campuses or work or have family commitments and find it difficult to attend weekly face-to-face meetings (Bower et al., 2015:2).

Given the difficult economic situation that humanity is experiencing, both from the Covid pandemic and the uncontrolled price increases due to the war in Ukraine, they make the flexibility offered by Synchronous Hybrid Education particularly important, as it promotes social benefit for students by providing equal learning opportunities to all, regardless of their economic status (Liu, Spector, & LiuIkle, 2018).

Synchronous Hybrid Education also presents benefits for the educational institutions themselves, as it enables them to offer more electives or specific courses, better catering for the different interests of the students (Bell et al., 2014:81). Bülow (2022:11) also documents in his research the challenges at the organisational level, which he says are often linked to the physical environment, such as small and inadequate classrooms, may be related to the logistical infrastructure as well as digital connectivity. When conducting a synchronous hybrid course, the teaching staff performs multiple roles, such as facilitator, moderator, speaker (Szeto, 2015) and has to effectively balance their attention between online students and classroom students (Wang et al., 2017:111).

Moreover, another challenge that the teacher has to face is to be able to adapt to the new educational environment of synchronous hybrid learning, such as getting used to talking to the camera, using the microphone or even a small mobile device to be able to monitor the online students (Wang et al., 2017:111). Managing students simultaneously requires a challenge for university faculty, as according to Bower et al. (2015:3) can slow down, reduce the pace and quality of their teaching, as the lecturer may have to repeat enough things either to be understood by both the people watching online and the people watching in the classroom or to be heard in case the people watching online did not hear something, which can negatively affect face-to-face learning.

The Synchronous Hybrid Education environment is particularly demanding and complex for the teaching staff, as all processes and all actions of learning require a complex design. In a face-to-face classroom, the instructor may simply ask a question and very quickly see a show of hands from students and ask a student to respond. In a Synchronous Hybrid Education environment to ask a question the instructor must go beyond the students in the classroom, where he or she can easily see who wants to answer, there are additional steps the instructor must take to see which of the people watching online will want to answer. These steps include scrolling through the participants' window to see which individuals have "virtually" raised their hand, selecting the student who wants to respond, turning on the student's microphone, checking to see if the student's microphone is working, and finally, receiving the response (Francescucci & Foster, 2014:43).

In face-to-face courses the teaching staff always have the possibility to see the non-verbal behaviours of their students, so they can understand if the topics they teach are understood by the students. In synchronous hybrid classrooms, people who are watching online are not always visible, especially when their camera is not on and not being used. Therefore, other alternative ways must be found for the teaching staff to understand if what they say is understood by the students watching online (Francescucci & Foster, 2014: 44).

The Synchronous Hybrid Education environment therefore requires a change in both pedagogical and learning design, with the result that teaching staff must adapt their teaching approach to create corresponding learning outcomes for both the online and classroom students, and to provide quality learning. Communication for

online students is a major challenge. Communication and interaction between online students and students in the classroom and between online students and lecturers are a challenge.

Unlike in the classroom where facial and body expressions are more visible, online students in synchronous hybrid courses find it difficult according to Wang et al. (2017:112) to ask questions and even get the attention of the lecturer or instructor. It is often difficult for them to speak, as they have to indicate when they want to speak either in written text or by raising their virtual hand and waiting to be seen by the teaching staff, and therefore they are sometimes limited to sending a text message, thus reducing their communication and interaction (Lakhal et al., 2017:52; Cunningham, 2014:45).

Another challenge that students who attend a course online in a synchronous hybrid classroom may face, in addition to the potential technical problems they may encounter and become frustrated affecting their participation (Cunningham, 2014:44), is the audio problems with student voice in the physical classroom and their difficulty to hear, especially when the classroom is noisy (Cunningham, 2014:37).

3.2   **Synchronous Hybrid Education Challenges and Pitfalls in Physical Classrooms**

Challenges and difficulties in a Synchronous Hybrid Education environment are also faced by students in the physical classroom. According to Wang et al.'s (2017:112) research, some students may lose their concentration in the lecturer's presentation, while at the same time it is not easy for them to collaborate and communicate with online members during a group project. For some students who attend the lecturer's presentation in person, both concentration and participation may be affected.

Bower et al. (2015) in the context of technology design consider that it is important to test the technology in advance. Teaching staff before the start of the course should test the technological resources so that they are as far as possible ensured to work properly. At the same time, it would be useful for teaching staff to make time available for online students either before the start of the course or after the end of the course to resolve any questions and difficulties they may have in using the technological tools. In this way, they will not have to interrupt the smooth flow of the course for technical issues and can create a comprehensive learning experience for all students, ensuring equal educational experiences while enhancing the sense of co-presentation among students (Wang et al., 2017:111).

According to Cunningham (2014:37), a teaching assistant could address technological difficulties such as the loss of online students' connection, connectivity problems that may arise, and audio problems. At the same time, there are studies in the international literature (Zydney, Warner & Angelone 2020:10) that consider that in Synchronous Hybrid Education environments it is important to distribute responsibilities and roles, as it is an educational environment in which many different roles are required, suggesting that students should take on more roles.

Zydney et al. (2020:10-11) document in their research that those students who attend a synchronous hybrid course face-to-face could, depending on their interests and experience in various tasks (troubleshooting technology problems, facilitating discussion, monitoring messages), act as student facilitators and assist the educational process. However, the research documents that students who act as facilitators in a synchronous hybrid course may feel pressured by the responsibilities they take on and feel that they need additional preparation.

Equipment in university classrooms according to Weitze et al. (2013:216) should be arranged in a way that allows:

- the teaching staff to see and hear the students who are attending face-to-face and online at the same time
- the face-to-face students to see the whiteboard/projector in the classroom and see and hear the teaching staff in the university classroom and their fellow students who are attending the course online,
- online students to hear in the classroom, see the whiteboard/projector as well as the teaching staff and fellow students on campus, depending on which camera is used on campus.

4. A case study: experiences and opinions of teaching staff and postgraduate students

The methodological approach used for data collection is qualitative research, as the experiences and opinions of both teaching staff and postgraduate students were collected and analysed. The aim of the research is to highlight both the advantages and the challenges that university institutions and the world around them will face in case of adopting Synchronous Hybrid Education. Semi-structured interviews are used, as they enable the researcher to control the content, the order and the reasoning of the questions, while at the same time giving the interviewees the opportunity to freely describe their experiences and express their views. The interviews were conducted by telephone. Recording and handwritten notes were used to collect research data.

The participants of the research are the teaching staff and postgraduate students of the Interdepartmental Master's programme in Educational Leadership of the University of Patras. 6 postgraduate students and 2 members of the teaching staff participated. Of the 6 postgraduate students, 2 attended the course exclusively at a distance and 4 attended it face-to-face. As for the 2 faculty members involved in the study, both have more than 20 years of experience in distance education, and in synchronous hybrid education their experience came from the needs created by the pandemic in the last two years.

The interview questions were divided into three main categories that were common to all participants. The three categories were related to technical issues, communication and the implementation of the courses in the Synchronous Hybrid Education environment. For the teaching staff, five (5) questions were created for technical issues, two (2) questions for communication and six (6) questions for course implementation. Similarly, for the students of the graduate program studied in this study, five (5) questions were created for technical issues, three (3) questions related to communication issues, and six (6) questions for course delivery. The challenges and advantages of Synchronous Hybrid Education were discussed with all the participants, recording their experiences and opinions, and their views on whether Synchronous Hybrid Education is considered an innovation. Prior to the implementation of the interviews, all participants were informed about the purpose of the research and to ensure their anonymity (Mills et al., 2017:206).

The first category of questions relates to the technical issues encountered in the implementation of synchronous hybrid courses, trying to document the advantages and disadvantages of using remote hybrid communication applications. At the same time, the participants were asked about the difficulties they encountered from technical issues when conducting the synchronous hybrid courses, while this subsection of questions was concluded with questions related to training issues in both new technologies and digital literacy. Discussing the advantages and disadvantages of using remote hybrid communication applications with the participants, flexibility was seen as an advantage by almost all participants.

- The advantages for me are that I don't have to commute to the university, it's easier for me financially and generally gives me the flexibility to attend from home, or my work.

- Being able to attend my courses remotely has annihilated the distance and it was also cost effective. Face-to-face learning is exhausting for me, to must attend a course after work, this is too many hours.

- It allowed me to continue my studies because otherwise I would have quit.

Distance learning students perceive Synchronous Hybrid Education as motivating because of the freedom to choose their own learning environment with the flexibility it provides in their daily lives (Weitze et al., 2013:223).

The most important advantages were the flexibility provided by Synchronous Hybrid Education and the benefits in terms of both cost and time savings. However, significant disadvantages were also recorded by the participants. The main disadvantage recorded is the problems associated with the interaction of distance learners with both face-to-face students and teaching staff. In all the responses the main challenge and difficulty is the interaction which was particularly difficult in the present study group which created other problems such as difficulty in understanding as well as participation of the distance learners.

Disadvantages were also recorded from the responses of the students who attended the course in person and from the teaching staff and are related to both the poor sound quality and the flow of the course as they consider that the distance students did not really participate in the course.

One disadvantage associated with Synchronous Hybrid Education is the technological problems that arise during the course. The technological equipment that the postgraduate teaching staff had was their personal computer and even a mobile phone for those teachers who did not have a laptop. This is the standard equipment of a videoconference, a microphone built into the computer, internet connection and the videoconferencing software. In addition, there is a projector in the room which mainly shows the slides of the lesson.

The most common technological problems faced by Synchronous Hybrid Education are the problems that arise when using and exploiting technological tools, such as reliable connections and slow internet speeds in different regions (Cunningham, 2014), latency times (Wang et al., 2018) and audio problems (Zydney et al., 2019:139).

The above is also captured by the participants' responses as the main and key problems encountered are related to both internet connections and speed, poor sound quality as well as poor equipment. Through the responses of the participants in the survey, the importance of the proper use of technology in education is recorded. Technologies which are constantly evolving offering infinite possibilities in the learning process can provide important solutions to the complex design of synchronous hybrid courses. The added complexity of synchronous hybrid classrooms (Bell et al., 2014:81) requires appropriate design as it is a new educational environment that combines two different approaches to learning, that of face-to-face learning and that of online learning.

The next section of interviews analyses communication in Synchronous Hybrid Education environments. Through the participants' responses it is evident that it is one of the major challenges that Synchronous Hybrid Education environments will face. Both communication in Synchronous Hybrid Education between teaching staff and online and classroom students and communication between students themselves were studied.

Teaching staff in a Synchronous Hybrid Education environment must encourage the social and emotional presence of the students in order to achieve meaningful communication and interaction between online and

classroom students (Francescucci & Foster, 2014:40). Increasing the co-presentation of students creates an essential foundation to support a seamless learning experience while improving the flexibility and accessibility of the courses offered (Angelone et al., 2020). However, in this endeavour they face several challenges that they must address.

The teaching staff studied in this paper used all available means available from the technological equipment combined with their extensive experience in distance systems and the use of digital collaborative tools created the basis for communication. At the same time, by creating discussion groups and setting collaborative learning activities between online and face-to-face students, teaching staff enhance communication between students (Bower et al., 2014), while contributing to knowledge construction, which occurs when students research topics, discuss, reflect and re-evaluate their positions (Jonassen, Davidson, Collins, Campbell & Haag, 1995:16).

On the part of the students, difficulties were recorded in terms of communication with the teaching staff. The face-to-face ones felt several times that they were unfairly treated and the distance ones that they were not given the opportunity to talk and interact. However, it was recorded that the teacher if well trained could and did create environments that were conducive to communication and eliminated the feeling of unfairness.

Both the teaching staff and students agreed that there is quite a big problem in the communication of face-to-face and distance students of the department. In Synchronous Hybrid Education systems there is quite a lot of difficulty in establishing relationships between online and distance students (Cunningham, 2014:46). The virtual classroom does not encourage in Synchronous Hybrid Education environments intense discussion and interaction (Flynn-Wilson & Reynolds, 2020: 46).

The third and last category of interview questions analysed the difficulties faced by the teaching staff when conducting synchronous hybrid courses. Then the educational material and the teaching method were discussed whether it is necessary to reorganize them. At the same time, the educational interaction techniques used by the teaching staff and the advantages and disadvantages that may arise from the introduction of a new hybrid learning were discussed.

The teaching staff during the implementation of the synchronous hybrid courses faced difficulties related to the motivation of the students and the limitation they felt from always having to stand near a desk, in order to be visible through the computer camera by the online students. They also mentioned the problems of connectivity and audio at the same time.

The reorganization of the educational material and the way of training are two issues discussed with the teaching staff. There was agreement on the view that both need reorganization with the only difference being that one member set the parameter that reorganization should only be done if Synchronous Hybrid Education is permanently established. The reorganization aims to engage all students in the educational process, while eliminating this feeling that there are two different groups in Synchronous Hybrid Education, each feeling opposite feelings about the other.

In the postgraduate programme studied in this paper, according to the participants' responses, all educational interaction techniques were used (e.g. online quizzes, participation in online forums, group activities, working groups, action groups, avalanche, brainstorming, etc.).

The adoption of Synchronous Hybrid Education provides the flexibility for learners and trainees to attend a course from wherever they wish, be it their home, work or wherever they need to be at the time the course is being implemented. At the same time, it enables participants who for various medical reasons cannot attend

the classroom and attend the course. Our recent experience has shown us how helpful such flexible learning environments are in times when socio-political conditions impose our constraint that the learning process is not lost. The advantages include the financial benefits of both travel and accommodation and living expenses.

A key design parameter of Synchronous Hybrid Education, observed through this case study, beyond the available logistical equipment, is the number of participants and the distribution of students. In order for Synchronous Hybrid Education environments to work effectively, it is to be composed of small groups, as the larger the groups, the more teacher-centered the course will become.

It should be noted that all students who participated in this case study, when asked in a future educational program they would attend how they would like to participate online or in person, all of them indicated that they would definitely prefer to attend it in person, however if their life circumstances did not allow it, they would choose to attend it online.

5. Conclusions

Synchronous Hybrid Education refers to the ability to attend a course simultaneously both in person from the conventional University classroom and remotely from the location of choice. This fact gives students the flexibility to attend the course either in person or remotely, depending on their needs.

As New Technologies evolve and are integrated into the educational community, it is deemed necessary to have sound pedagogical principles in order to use them with quality criteria and characteristics. As regards the technical and technological issues related to Synchronous Hybrid Education, it is concluded that on the one hand they offer flexibility but on the other hand they create several challenges.

The flexibility offered by Synchronous Hybrid Education is related to the choice of attending. When students choose to attend online or distance learning, they have significant financial benefits in terms of both travel and living expenses. Considering the difficult economic situation that our country has been going through in recent years due to socio-political changes and conditions, it can be concluded that this flexibility could enable many students to either continue or complete their studies.

At the same time, it was found that Synchronous Hybrid Education also contributes to Lifelong Learning as it enables the completion of additional training for those who cannot attend face-to-face training programmes. It is concluded how important flexibility is as it enables socially vulnerable groups, people with medical problems even in times of pandemic to attend the course in real time and interact remotely with their classmates and teaching staff.

However, it became apparent that Synchronous Hybrid Education also has significant disadvantages for the educational community for both learners and trainees and teaching staff, mainly related to interaction and communication. Through the research it was found that the interaction between distance learners and face-to-face students faces significant challenges. Often online students feel disconnected from the classroom as they are physically separate and find it difficult to communicate and interact with either face-to-face students or the academic staff. The face-to-face students were also found to find it difficult to develop communication relationships with the distance learners. At the same time, inadequate logistical equipment as well as the non-digital literacy of some faculty members makes the learning process in Synchronous Hybrid Education environments difficult.

Through the literature review and the study of the views and experiences of the participants in this study, it is concluded how important for Synchronous Hybrid Education is the right technological equipment, which

should allow all participants to see and hear all members present in the course. Significant complaints were recorded about the access to the internet, the quality of sound and communication and the equipment in general. It is advisable for the educational leadership of higher education to take all of these into consideration before the possible adoption of Synchronous Hybrid Education by higher education.

A further conclusion is the importance and necessity of digital literacy and training in New Technologies with qualitative characteristics for all participants in the educational process. Living in the 21st century, where technology is at its peak, it is necessary to have digital literacy for both educational staff and in order to be able to exploit the positive characteristics of Information Technology in a pedagogical way.

It appears that the reorganisation of educational material for Synchronous Hybrid Education is equally important. The educational material should be created with the fact in mind that it refers in parallel to two different educational environments, which usually have opposing educational practices, and these two educational environments should help to unite and interact, giving equal opportunities to all learners and trainees for equal involvement in the educational process. At the same time, it ought to contribute to facilitating the teaching staff to balance their attention between the students of both the university classroom and the online ones.

Synchronous Hybrid Education can offer significant advantages to learners, trainees, teaching staff and the academic institutions themselves, provided that there is proper educational design with sound pedagogical principles and realistic assessments of the challenges they will face in its potential adoption. The logistical equipment, the available technology, the skills of the teaching staff, the number of participants, the feelings of the participants as well as their digital competencies for the educational use of the technology should guide decisions on the ability to adopt Synchronous Hybrid Education.

In conclusion, this study would consider Synchronous Hybrid Education as an innovation. Nevertheless, there were documented views that did not consider it an innovation as distance learning existed before, so it does not offer anything innovative, or they described it as an evolution rather than an innovation. Synchronous Hybrid Education will enable Greek higher education to innovate and exploit new technologies and with a view to its openness, giving the opportunity to those who wish to but cannot for specific reasons (economic, social, health reasons, etc.) to access higher education but also with a view to extroversion and providing quality education and enhancing learning outcomes.

If higher education leaders can address the significant financial challenges and in some cases the introversion that characterizes many higher education institutions, will be able to follow the socio-political changes and developments of the 21st century. Synchronous Hybrid Education is at an early stage for the Greek reality. Due to the pandemic, it was implemented quite abruptly and without proper planning and the necessary equipment, however it is concluded that if it is given time for quality educational planning it will be able to be an important breakthrough in the educational reality.

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Student Readiness and Student Support

Student Readiness for Online Learning:
A Systematic Literature Review During the COVID-19 Crisis

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Abstract

This paper is based on the premise that learning how to learn online is now a crucial life skill; it must not be left to chance. Set against the backdrop of the COVID crisis and as part of the Erasmus+ DigiTeL Pro project, this paper begins by reporting what is already known about the domains of readiness for learning online. While the term has a long history there are different conceptions of student readiness with a lack of consensus in the literature.

The paper then describes a systematic analysis of the literature published during the COVID crisis, focusing on student readiness. This study sought to answer three main research questions: i) What research has been published reporting student readiness for online distance learning during the COVID crisis? ii) How strong is the "learner voice" in COVID- related research reporting on student readiness for online distance learning? iii) What lessons can be taken from the COVID-related literature on student readiness for new digital education models?

The literature search methodology is described, which identified a sample of over 40 relevant publications. The related data extraction template and analysis techniques are shared along with a descriptive profile of the literature. Overall, the paper confirms a previous observation that there was a lot of emergency remote research conducted during the COVID crisis alongside emergency remote teaching (Bond, et al., 2021). Indeed, with a handful of exceptions, there is limited evidence of previous student readiness literature on online learning informing the COVID response. There is even a risk of some research literature undoing what is already known. Secondly, the findings raise questions about the current conception of readiness and new and emerging domains that need to be understood in future research, including the importance of the educational context and the notion of relational readiness. Thirdly, the study illustrates that most of the survey research published on the student COVID experience is not a good proxy for the learner's voice. There is little evidence of research being intentionally designed from a methodological perspective to encapsulate the student experience. Hence, a significant gap remains in telling the student story or experiences of their personal readiness for online learning in their own words.

Finally, the value of the student voice is briefly illustrated through the experience of a free online readiness course developed during the pandemic to help bridge theory and research with practice. With an underlying ethos of 'for learners by learners', the course experience underscores the value of working in partnership with students to help develop new solutions to the challenges and opportunities posed by new digital models of higher education.

Keywords: student readiness, online learning, literature review, COVID-19, learner voice

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Diversity & Inclusion in Open and Online Education

Digital Reset and Instructional Reset within On-Line Higher Education Framework: How the Community Inquiry Model could contribute to more successful and inclusive online learning environments.

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Abstract

Online courses continue to increase rapidly, with nearly a third of higher education students in 2017 taking at least one online course and over 15% of those students enrolled exclusively in online classes. However not all students find online courses satisfactory or to be their preferred learning method. Differences in outcomes and perceptions of online classes might be related to differences in the practices of delivery, specifically pedagogical and course related factors. The unexpected shift to remote teaching, due to Covid-19 pandemic, in 2020 underlined the critical need to continually reflect on how online learning environments are being constructed and how learners can be benefited from the on line instruction. Community of Inquiry (CoI) model (Garrison et al., 2007) was developed to address barriers in in higher education online settings. Three interlinked presences make up the CoI model: social presence, teaching presence, and cognitive presence. The focus of our research will be on the third presence, cognitive presence, which has been related to success within higher education settings. Using qualitative approach (semi - structured interviews), we will attempt to examine *how instructors foster cognitive presence within online courses.* The subjects of our inquiry will be lecturers/research associates in various on line courses of the Hellenic Open University. Our approach will have an exploratory dimension in order to discern what kinds of facilitations promote cognitive presence and minimize the barriers in online settings.

Keywords: On-line learning , Higher education, qualitative methodology, Community of Inquiry (CoI) model, cognitive presence

1. Introduction

In the digital age, so much affected by the globalized knowledge-intensive economy, 21st-century learners demand ubiquitous, personalized, flexible, and socially collaborative educational experiences (Bozkurt et al., 2021).

Reviews of college and university enrollments from 2003–04 to 2015–16 demonstrate that the percentage of undergraduates registered in online courses increased from 15.6% to 43.1% (de Brey et. al, 2019), and this figure does not take into consideration the increase or online learning courses and modes due to the 2020–21 COVID-19 pandemic. While online delivery formats present a lot of variations (e.g., synchronous, asynchronous, hybrid), asynchronous learning pedagogies have been criticized that they often focus on a reduced delivery of learning and community engagement and are less effective in relationship-building and collaborative learning (Moallem, 2015; Peterson et al., 2018; Roseth et al., 2011).

However, asynchronous modalities are regarded by many to be the most flexible that students have, considering the fact that there because there are no required virtual class meetings, the students can engage the course in ways compatible with their own schedules (Hrastinski, 2018; Lim,

2017), and can more easily balance education and work/life obligations (Harasim, 2000). More specifically asynchronous online learning that has the potential to offer flexibility, enhance learning, and "*mitigate class engagement concerns [on]the collaborative discussion board*" (McCarron et al., 2021: 199).As it has been argued that motivation, satisfaction, and learning are related within the context of online education (Brooker et al., 2018; Hsu et al., 2019). This relation in the framework of shifting to online learning during the COVID-19 pandemic has been highlighted (Baber, 2020; Moore, 2020). This turn to emergency remote teaching (ERT) in 2020 (Hodges et al., 2020) underlined the critical need to continually reflect on how online learning environments are being made.

Undoubtedly Higher education has considered community as essential to underpin collaborative learning associated with higher levels of learning. Despite the fact of absence of face to face communication and the disconnectedness that   online learning communities entail, it could be argued that a spirit of community can be developed online (Rovai, 2002a; Thompson & MacDonald, 2005). The community of inquiry (CoI) model (Garrison et al.,2007) is considered to be a flexible solution to problems of this type and creates a wide perspective in education and research.

2. Community of Inquiry (CoI) Model

A community of inquiry is rooted in collaborative knowledge creation and draws from the educational philosophies of Dewey (1938) and Lipman, (1991). As a concept community of inquiry could considered as a group of people united in the examination of an area of common interest via a process of dialogue-based inquiry. Such a community involves (re)constructing experience and knowledge through the critical analysis of subject matter, questioning, and the challenging of assumptions. "*A community of inquiry attempts to follow the inquiry where it leads rather than being penned in the boundary lines of disciplines. A dialogue that tries to conform to logic, it moves forward indirectly like a boat tacking into the wind, but in the process its progress comes to resemble that of thinking itself....They come to think as the process thinks*" (Lipman, 1991, p. 15).

If we consider CoI by the environment or activity space where it takes place (on-line or face-to-face) in the case of of on-line communities that constitutes a framework of of a virtual research network as a collaborative inquiry platform which functions as a shared web-based work space, file store and a range of communication, research and collaborative writing tools. All The afore-mentioned render on-line CoI as a vital, flexible teaching instrument.

Garrison et al. (2000) developed a comprehensive framework to guide the research and practice of online learning (see Fig. 1). The framework consists of three elements – social, teaching and cognitive presence – as well as categories and indicators to define each presence This framework has resonated with the online learning community and provided insights and methodology for studying online learning (Garrison, Cleveland-Innes, Koole, & Kappelman, 2006)

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Community of Inquiry

Fig. 1. Community of inquiry framework.

(From: Garrison at al., 2007: 158)

ELEMENTS	CATEGORIES	INDICATORS (examples only)
Social Presence	Open Communication Group Cohesion Affective Expression	Risk-free expression Encourage collaboration Emoticons
Cognitive Presence	Triggering Event Exploration Integration Resolution	Sense of puzzlement Information exchange Connecting ideas Apply new ideas
Teaching Presence	Design & Organization Facilitating Discourse Direct Instruction	Setting curriculum & methods Sharing personal meaning Focusing discussion

Fig. 2. Community of inquiry elements, categories and indicators.

(From: Garrison at al., 2007: 159)

Social presence is delineated as the ability to project one's self and establish personal and purposeful relationships. The three main aspects of social presence, as defined here, are effective communication, open communication and group cohesion. As valuable as it is to establish effective communication and developing social bonds, it is essential that the group feels secure to communicate openly and coalesces around a common goal or purpose for a community to sustain itself (see Fig. 2). Also there are seem to be a strong relationship between social presence and learning outcomes (Arbaugh, 2005b;Hwang & Arbaugh, 2006; Williams, Duray, & Reddy, 2006; Yoo, Kanawattanachai, & Citurs, 2002). It should be noted though, that social presence is less

important if the learning activities are just information acquisition and there are no collaborative assignments where students can benefit from the perspectives of others (Picciano, 2002).

Garrison et al. (2000) described *teaching presence* as the design, facilitation, and direction of cognitive and social processes for the purpose of realizing personally meaningful and educationally worthwhile learning outcomes. Moreover, Anderson, Rourke, Garrison, and Archer (2001) conceptualized teaching presence as having three components:(1) instructional design and organization; (2) facilitating discourse (originally called " building understanding "); and (3) direct instruction. In general, teaching presence is a significant determinant of student satisfaction, perceived learning, and sense of community.

Cognitive presence is regarded to be the exploration, construction, resolution and confirmation of understanding through collaboration and reflection in a community of inquiry (Garrison, 2007). However, research indicates that inquiry invariably has great difficulty moving beyond the exploration phase. Meyer observes that integration and resolution is more demanding than exploration and, as a result, increased time for reflection is required.

The CoI functions as thethe interplay of three presences to create an educational experience. What is noteworthy is that the articles that highlight cognitive presence would also discuss the other presences of teaching and social presence. Several studies focused specifically on the relationship between cognitive presence and one other presence. The relationship between cognitive and social presence was the most common relationship (DuBois et al., 2019; Kucuk & Richardson, 2019; Morueta et al., 2016; Sağlam & Dikilitaş, 2020), Otheer research articles examined the relationships between the three presences. In the study conducted by Sağlam and Dikilitaş (2020), a positive correlation was found between all three presences.

The aim of our small scale research is to examine *how instructors foster cognitive presence within online courses.*

3.Materials and Methods

3.1 Approach to Data Collection

This study, consistent with Braun and Clarke (2006), used thematic analysis in an open-ended way, to investigate how as instructors foster cognitive presence with online courses. The researcher employed a purposive sampling.

3.2 Interview Process

 Participant interviews were taken via phone. Interviews were semi-structured; a guide provided a loose structure within which to explore the topics of interest. The central question were: "*how to you try to foster cognitive presence with the online course you teach*" Where appropriate, the interviewer prompted participants to expand on relevant and interesting responses.

3.3 Participants

Purposeful sampling is a widely used technique in qualitative research whereby those cases most likely to be information-rich on the point of interest are selected in order to effectively use limited resources (Patton, 2002). We selected eleven people (six women and five men) out of eight undergraduate and forty three post graduate online course lecturers (Hellenic Open University). They all had experiences from other short or long term courses . Respondents participated without

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incentives. As the goal of the study was to gain a understanding on the ways which participants' (P) use in online courses in order to foster cognitive presence , data such as mean age etc. are not reported as it might convey the unwarranted impression of generalizability and quantitative robustness.

3.4 Data Analysis

This study used thematic analysis (Braun and Clarke, 2006). They define thematic analysis as "a method for identifying, analyzing and reporting patterns (themes) within data" (p. 79). This definition supposes that an analyst produces a generalized understanding of coded data based on the recurring application of codes and the patterns associated with those codes. The frequency of the codes appearance in the data set, makes the analyst to decide that code as the basis of a theme. The analyst's perspective to thematic analysis inherently depends on the specific research questions they use to guide their study. Actually thematic analysis is a fundamentally question-driven exercise that depends on clearly articulated lines of inquiry to frame the scholar's interpretation of the data (Lochmiller, 2021). Codes are considered to be, "a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data" (Saldaña, 2015:4)

As Riessman (2011: 311) noted, coding causes "detail and specificity to slip away in favor of general statements about the phenomenon of interest". Coding means that interviews and other data sources are "fractured" into smaller analytic bits that become the basis for "generalizations about human processes that hold across individual participants". This required the transcription of interview recordings and then careful reading by the interviewees in case there was any sort of misunderstanding and after this followed the coding stages.

4. Results

The analysis and the coding procedure produced three themes:

   (a) activation

Almost all participants mentioned that they make an effort to raise issues very frequently on the class forum board online to increase the students interest.

P1(woman): "…..*during my course preparation I make sure that I have jotted down a lot of questions to get them interested in all aspects of the course*"

P8(man): "…..*I make sure that every now and then I post some issue or possible problem in relation to the material I have already given them in order to keep them going*"

P4(woman): "…*I make sure that the course activities get them interested and I try to make them give evidence of this on the online forum so they can exchange ideas and keep their appetite for learning active*"

P11(man): "….*sometimes when I feel…that the participation in the forum online is rather low, I put on an issue or another dimension relating to the course and I ask for their opinion. I also sometimes make a mistake deliberately, just to make them explore content issues and trigger their interest to look for more themselves…*"

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P8(man): "…..*getting students motivated is not always easy …that's why I design some of the course activities in such a way so they I make sure that they become curious and focus their interest in other broader aspects of the course*"

(b) Exploring

Almost all participants mentioned that they try to get their students use a variety of information sources and techniques in order to explore the various issues that are brought about in the course.

P4(woman): *"…..I constantly encourage them ..not to hesitate and use various sources of information to do their tasks…some of them hesitate…some others are a bit bored but I try to make them see the benefits of it"*

P6(woman): *"….. when there are questions relating to the course content I apply the brainstorming technique with them and we come up with the relevant information in order to find solutions to the problems"*

P9(man): *"…..I set a time when the majority of the students are available and we hold on line discussions about various topics and issues which have been brought up…..trying all together to find the best possible solution."*

(c) Peer Facilitation

Almost half of the participants mentioned   how a number of students were assigned with facilitating discussions and served as a kind of moderator for the others and they were able to provide information to their peers.

P3(woman): "…..*I have to say that some of my students were more keen and active to participate and facilitate discussions and help their fellow students, so I let them do it…in some cases they even came up with new information that they had found themselves and shared it with the others*".

P10(man): : "………*right from the start I tasked some students, after asking them of course, to undertake the moderetor' s role and facilitate discussion in the forum*"

5. Discussion

The way which   discussion forum is utilized into the course apparently has an impact on the development of cognitive presence within the course. The instructor's role is of paramount importance because s/he creates the activities, makes sure that there is peer facilitation or participates actively in the discussion forum (Shea et al., 2006; Shea & Bidjerano,2009).
It also indicates that there are various ways that cognitive presence can be fostered within a course. A more conventional role includes posing discussion prompts and then facilitating the conversations and discussion (Bissessar et al., 2020; Cho & Tobias, 2016; Gašević et al., 2015; Rolim et al., 2019; Saadatmand et al., 2017). However it is argued that instructor participation within the discussions did not significantly increase student learning (Cho and Tobias 2016). Instructors can

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also facilitate discussions via the coordination of synchronous sessions and/or activities (Kumar et al., 2011; Molnar & Kearney, 2017)

It has been suggested that instructors should take a holistic approach to how they integrate and use technology within their course. Instead of focusing on just one area, instructors should seek to provide multiple opportunities for students to engage with each other and the content (Saadatmand et al. 2017). Moreover, has also been found that applying the principles of problem-based learning helped to foster the learner-learner interaction and learner-context interaction that is critical for cognitive presence (Saadatmand et al. 2017).

5. Limitations and Future Research

It is a preliminary, small scale research, centering on a single a single faculty therefore its findings cannot be generalized. As more research will be conducted around cognitive presence and the application of CoI model both the qualitative and the quantitative perspective of this project will be taken into consideration.

6. Conclusions

As we have seen discussion forums are an instructional tool within online learning environments, but the forum itself doesn't create cognitive presence. The integration and the resolution parameters of the cognitive presence seem to be much more demanding than the exploration parameter. Moreover, creating discussion forum assignments does not seem to be enough to have students reach the integration and resolution stages of cognitive presence. Instructors should have clear intentions in how to design and structure their courses to ensure that there is the best engagement between learners and the content.

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Openness Is not Enough Without Inclusiveness: The Learning Analytics Parable

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Abstract

Distance Learning has often been side by side with the notion of Openness. The MOOCs' hype was partly due to the wide Accessibility that prestigious universities offered to a wide audience of learners who were following along the technological progress and could afford the cost and time expenses for learning sustainably. However, education should also embrace the concept of inclusiveness. That means that online learning should become more open not only in terms of admission but also in terms of student support. Additionally, learning material should be able to adjust to the diversity of students' needs, backgrounds, and skill levels. Universal Design addresses these issues and can provide general guidelines to achieve the necessary personalization.

For an educational environment to address all these needs, the educational stakeholders should be aware of their students' skills and limitations. The idea of "knowing your audience" is the answer to the problems of the "one size fits all" education. In that respect, the educational design can significantly benefit from Learning Analytics (L.A.). The dynamic learning process focused on students' diversity is included in the 21st-century educational policy targets. At the same time, the advances in L.A. provide new opportunities for the adaption of more flexible and effective e-learning environments.

The LA approach, which measures, collects, and analyses educational data for reporting and creating actionable knowledge about learners and their contexts, offers the capability to implement real-time assessment and feedback systems and processes focused on improving knowledge, developing self-regulated learning skills, and academic success. Additional aspects of L.A. related to the analysis of students' social behavior, sentiment, and participation could reveal hidden difficulties or even problematic situations that are not always obvious to the tutors by the naked eye, allowing in this way the adoption of a learner-centered educational approach. The incorporation of Machine Learning techniques could enable the creation of digital twins, a digital replica of students' learning-related information for personalizing teaching methods, pace and content.

This paper aims to discuss the role of L.A. in the instructional design process for online inclusive learning environments. Based on recent data, the study puts inclusive education on the L.A. community's agenda to identify flexible, personalized instructional design patterns focused on learners' academic needs. Furthermore, the paper discusses the opportunities and challenges which lay the foundations for designing a more dynamic and inclusive learning environment as an ambitious scientific field that showcases how design and control go hand in hand.

Keywords: distance learning, inclusive education, accessibility, learning analytics

1. Introduction

For the last two decades, the need for online courses has increased dramatically due to the convenience of the flexibility of scheduling and the opportunity for learners to adapt online education to their lifestyles. The ease of access to emerging open-access technologies and multimedia learning resources has allowed many online learners to benefit from the media-rich learning content and explore enormous amounts of relevant information. Furthermore, learning management systems (LMSs) and analytics tools can monitor students; engagement by tracking various information about their progress. LMS can also provide educators with feedback and analyses of students' data to take future learning decisions. Although specialists and educators can use this data to reflect on the teaching procedure, there is little information on how to interpret these data regarding learners' habits and needs (Viberg et al., 2018).

Learning Analytics (LA) is used to create knowledge that would benefit the educational process, especially in distance learning settings where the physical and often the temporal distance reduces the amount of information that tutors and students share concerning their activity, understanding, interest and so on. At the same time online learning environments may solve the problem of physical access to a university campus, yet, there are different barriers posed by the use of certain technologies. Since distance learning has often been side by side with the notion of openness, it is of high importance that an inclusive design would be applied in distance learning courses. However, the awareness of the barriers and difficulties that some groups of people face is not self-evident.

2. Background

Inclusive education is an educational approach that proposes opening schools and universities to all students' uniqueness where all can participate like equal members. It is adjusted to social justice. In the Inclusive class of the future, the educational context focuses on the need to provide a high-quality educational response for all students, increasing the practices that lead to all participation (Messiou et al. 2016).

The idea of Inclusive education was structured in 1986 by the Regular Education Initiative movement (REI) in the USA, whose visionary was Madeline Will, the central secretary for special education and rehabilitation service (Office of Special Education and Rehabilitation Services) (Courtad & Bakken, 2011). The first discussions in the US about inclusive schools appeared in the literature in the mid-1980s, adopting a philosophical model much more profound and multi-layered than inclusion-integration (Winzer, 2009). However, the formal adoption of inclusive, comprehensive education occurred after the United Nations declaration (1989), as well as the Salamanca Declaration (1994) (Angelidis, 2011).

Inclusive education was implemented within educational settings prior to Higher Education. However, for the last few years, inclusive principles have been inserted into university policies, research and teaching approaches and practices (Moriña, 2017). Following considerable research, the university should be responsible for responding to inroad inclusions in their educational context (Garrad & Nolan, 2022; Frechette Gunawardena & Layne, 2016; Lang, Freeman, Kiely & Woszczynski, 2022). As Gairín and Suárez (2014) claimed, transitioning from a compatible to an inclusive university indicates a quality university.

Digital technology brings new opportunities for learning environments with enhanced and effective digital educational resources and e-learning platforms. More students have the opportunity to earn access to the educational landscape of higher education (students from remote areas with mobility difficulties, financial weaknesses, workers, e.t.c.). However, digital technology also creates barriers for students with disabilities

following the rush to digitalization. Inaccessible and non-exclusive digital learning platforms, such as learning management systems (LMS), MOOC platforms, and digital applications, could prevent students with disabilities from gaining equal information as non-disabled students and fully engaging in learning activities (Chain, 2021).

The 2002 UNESCO OER Declaration highlighted that Openness, the idea that data should be freely available to everyone to use without restrictions, leads to development through the change enablers and local innovators, who will bring inclusive innovations for the benefit of society. Open-source software (OSS) development provided an example of a successful open innovation system, which led to the development of a wide array of software applications as required in every sector of life, including in laboratories, educational institutions, R&D centers, and small-scale enterprises (Madalli, 2015). However, is Openness a sufficient stimulation to enhance distance learning and e-learning to achieve inclusion? For Harrison & DeVries (2019), since the "openness determinism" provided as a solution for excluded learners, the importance of a social justice perspective was lost to what has been labeled the idea that somehow Openness will democratize education.

On the contrary, the lack of consideration of Accessibility of all in e-learning can be a parameter that must be measured as an essential reason. Al-Azawei, Parslow & Lundqvist (2017) claimed that the Universal Instructional Design (UID), a term adopted by architecture, is an essential strategy that has to be adopted by educationalists to tackle accessibilities limitations in curricula design. UID is an inclusive psycho-pedagogical approach aiming to break down learning processes' barriers by valuing diversity, inclusive education and the critical and conscious use of ICT (Information and Communication Technologies) (Baek & Aguilar, 2022; Rossi, 2022). UID focuses on understanding students with disabilities' challenges and providing them with access via designing an inclusive, adaptive and flexible e-learning environment for all (Chain, 2021; Moriña, 2017).

As the Accessibility of tools and information can potentially prevent students with disabilities, new technologies such as Machine Learning (ML), Digital Twins (DT), Big Data and LA have not paid attention to a purely inclusive direction (Toetenel and Rienties, 2020). LA is a new field of study that deals with evidence-based technology-enhanced learning. The term refers to the measurement, collection, analysis, and reporting of data about learners and their learning contexts to understand and optimize learning. LA's potential to provide timely, active feedback and interventions has resulted in higher educational institutions deploying LA-informed learning and developing management tools to improve student learning, retention and success (Klein, Lester, Rangwala & Johri, 2019). The starting point is usually hypotheses about learning. After that, researchers apply the existing methods to assess the learning theories about how students learn. LA focuses on the educational challenge seeking to answer how we can optimize opportunities for online learning. It involves interpreting and contextualizing data to improve understanding (Mavroudi, Giannakos & Krogstie, 2018)

Specifically, in higher education, LA has demonstrated its benefits, including targeted course offerings, curriculum designing, student learning outcomes, behavior, self-regulation learning, improved instructor skills and enhanced research. Also, LA contributes to quality assurance and improvement, boosts retention rate, and assesses and acts upon differential outcomes among the student population and variety (Chen, 2021).

Based on the above, it seems that online teaching has become a 'design science', as LA aims to improve teaching quality by supporting educators and students to achieve goals via innovative and more effective learning paths. Based on LA technologies, the definition of UID is interwoven with the methodology for enabling designers to take measurements for more informed decisions in how they go about designing learning activities and interventions pedagogically based on appropriate resources, tools and technologies to facilitate learning for all (Toetenel and Rienties, 2020).

In accordance with Phillips et al. (2021), in the LA sector, the interest is increasing in implementing descriptive tools that allow teachers, students, and designers to quickly reflect on the learning process and improve instruction (Phillips and Ozogul, 2020). As a Learning Analytics Dashboard (LAD) aims to provide students with information about their engagement with course materials and assignments e.t.c., Self-Regulation Learning (SRL) seems to be the theoretical foundation mainly used for designing LADs. SRL is a procedure divided into three phases: forethought, performance and reflection, and it occurs as a set of strategies, such as goal setting, strategic planning, time management, help-seeking, e.t.c. Students with SRL skills are metacognitive, motivationally and behaviourally active in their learning, leading to higher academic achievements than novice learners (Jivet et al., 2020).

LA can potentially contribute to including all students, even those with disabilities, in higher education and e-learning via suggestions on how to design inclusive platforms. It seems to be the appropriate time for a specialist in LA to ensure Accessibility and Inclusion in the e-learning environment of higher education (Mershad & Wakim, 2018). For instance, Jivet et al. (2020) developed a learning analytics tool to support teachers and students with insights into the learning design of courses, the timing of feedback the metacognitive competencies of students. Strategically involving students in the LA designing of tools create inputs on how to develop inclusive tools that provide balanced opportunities. In this context, inclusive and SRL design do not refer to adapting features to students' preferences but rather to their needs and skill levels. Toetenel and Rienties (2020) claimed that the different use of learning materials could significantly impact success. They found that students' timing of engagement did not match the Learning Design. Most of the "successful" students tended to work ahead of the course schedule, while those who failed the module increasingly spent time catching up from previous weeks. This became more problematic later in the module, where "failed students spent on average much higher proportion of their time on catching up activities compared to passed and excellent students" (Nguyen et al. 2018, p145).

Whether or not specialists design online education opportunities for these diverse sets of students, the literature review highlights that a few studies have empirically tested whether educators design inclusive learning environments (Toetenel and Rienties, 2020). Based on this, the specific systematic literature review study aims to discuss the role of LA in the instructional design process for online inclusive learning environments. In this context, this literature review aims to address the issue of how learning analytics can used to improve instructional design for inclusive online environments in higher education. Additionally, we aim to investigate how published scientific research investigates the opportunities to improve inclusion via designing flexible learning paths based on learning analytics data and the new trends that are proposed to improve the instructional design.

3. Methodology

3.1. Methodology

A systematic literature review is applied as a method for the present study. The systematic review concerns thoroughly searching the relevant literature to minimize systematic or random errors. Reviews are secondary works describing a subject's previous and current situation (Elliot et al., 2017).

The design of a systematic review follows a series of steps. 1) the development of review protocol, 2) the definition of entry and exclusion criteria, 3) the search and identification of appropriate terms and procedure, 4) selection, 5) evaluation of the quality of methodology of these papers, and 6) interpretation of the results presentation of the review.

3.2. Search strategy–entry and exclusion criteria

To select the texts to be investigated, those concerning the content, time and institution were set as entry criteria.

In more detail:

-Content: Theoretical studies and research papers should have as their primary content the use of LA in educational design with a view to inclusive education in distance higher education.

 -Time: The newest theoretical studies and research papers should be identified from 2016 onwards.

-Institution: Institutions of higher education providing distance and online learning courses

The study included peer-reviewed journals or book chapters and (full or short) conference papers published during the period 2016-2022.

Excluded articles were articles that did not present empirical results, articles that were related only to one of the constituent domains of study, and papers included in conference proceedings either as posters or demonstration papers. The articles that consisted of introductions, posters, and summaries and these which are not written in the English language were eliminated. The searched words should be in the title, abstract, or keywords.

3.3. Search strategy–search terms and procedure

The databases used for this review are the IEEE Xplore, Routledge, Springer, JSTOR, ACM Digital Library, Sage, Cambridge University Press and Wiley online library. Furthermore, the search included the Google Scholar list of the most indexed educational technology journals: Computers & Education, the British Journal of Educational Technology, and Education and Information Technologies. The search was done using specific keywords. Boolean operators were utilized to construct the search algorithm. In particular, the AND operator conjugates the terms from the sub-groups. Each pivotal time was written in quotation marks (" ") so that it could be searched as such in the databases (Bozkurt et al., 2020). Specifically, the keywords used to retrieve the articles were:

i. "Learning Analytics"+ "Inclusive education"
ii. "Learning Analytics"+ accessibility+ education
iii. "Learning Analytics"+ "Instructional design"
iv. "Learning Analytics"+ "Universal design"

3.4. Data extraction

The search strategy revealed 55 papers. The selection criteria were satisfied by 29 papers. Consequently, 21 studies were finally included in the review presented herein. According to the search strategy, all studies are empirical. Ten are journal articles, six are full conference papers, and the remaining five are short conference papers. They were analyzed in detail according to the coding scheme suggested by PRISMA.

This is followed by the interpretation of the results, which presupposes knowledge of their limitations regarding their methodological quality, which may undermine the reliability of the findings as insufficient methodological quality of the primary works leads to inconsistent results. Systematic errors can distort the findings of the systematic review.

4. Results and discussion

As mentioned above, 29 articles matched the inclusion criteria. The papers were grouped into four categories according to their focus (Figure 1). Thus, there are nine articles about LA and instructional design with no explicit mention of inclusiveness or accessibility. These articles were included due to the relevance of their results and recommendations for accessible and inclusive learning. There were also nine articles about inclusive learning but there was no explicit mention of LA. However, educational data analysis was incorporated at some point in the research design. Six articles were focusing on LA and inclusive education and five articles were on LA and universal design.
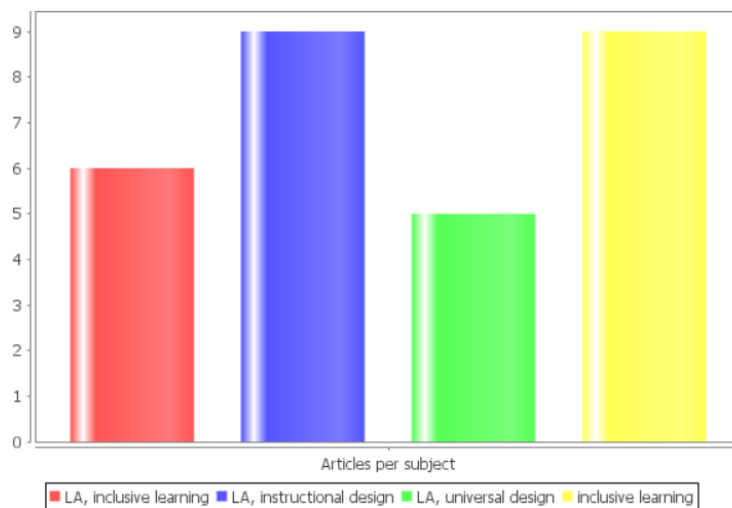
Figure 1: Number of articles by subject

Most of the articles were published in 2020 (nine articles). Additionally, during each of the years 2016, 2021 and 2022 five of the included articles were published. Two were published in the year 2017, two in 2018 and one in 2019. This distribution per year can be shown in Figure 2.

Figure 2: Temporal representation of the included articles' publication

The next step was to create a word cloud from the titles of the articles as an indication of the total orientation of the research. The titles were concentrated in one document and the stop words were removed. Finally, a cluster of the most common words was created, where the magnitude of each word reflects the frequency of the word in the document (figure 3).
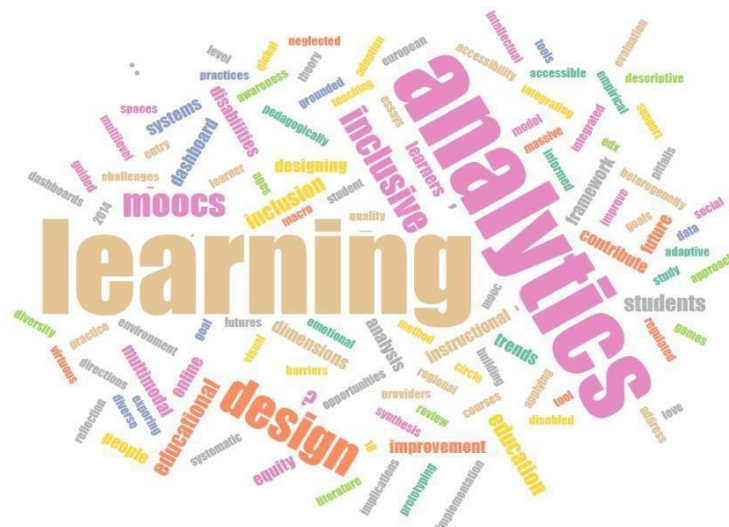
Figure 3: The titles' word cloud

As it was expected the most common words that were included in the articles' titles were "learning analytics" since this term was included in every query. The terms inclusive, inclusion and design also stand out confirming the relevance of the articles with our subject. The acronym MOOC (that stands for Massive Open Online Courses) is another distinguishable word even though it was not included in the keywords and does not directly reflect the focus of our research. These results can be explained if we consider the innovative approach that MOOCs introduced in both traditional and distance learning. With the hype of MOOCs that started in 2012 a lot of higher education institutions revised their methods and their services and adopted more accessible and inclusive approaches. In that sense, MOOCs are implicitly related to the context of this research.

In relation to the research method that the retrieved articles were incorporated, there were clustered into five groups:

i. Review articles
ii. Quantitative research articles
iii. Qualitative research articles
iv. Mixed methods (that is a combination of quantitative and qualitative research)
v. Articles that implement and propose a certain methodology or present a prototype or application

The pie chart of the number of articles per type of research method is shown in Figure 4. Five of the articles presented a prototype or an application or a methodological approach that was related to an attempt to improve accessibility and inclusiveness in education. Six articles were empirical studies using mixed methods approaches for investigating the level of accessibility in education. Four articles presented qualitative research and only one article used a quantitative approach. Almost half of the articles (13) were reviews investigating the subject of inclusiveness in educational settings and the related methods to achieve it.
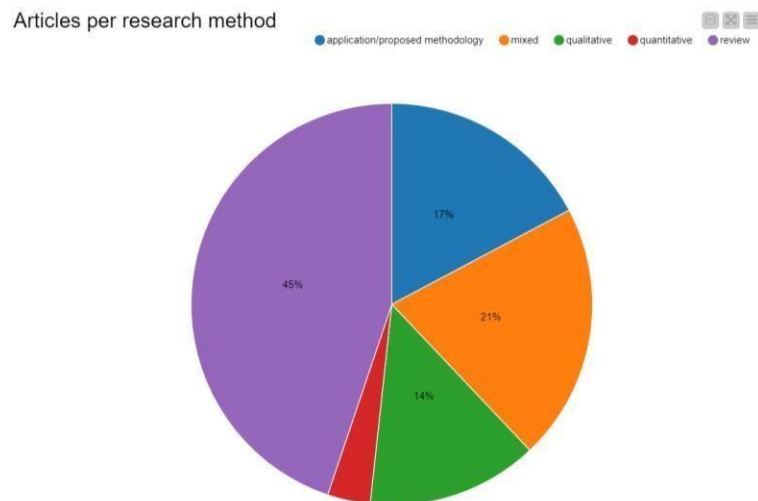
Figure 4: The pie chart of the number of articles by research method

In every one of the selected articles, the author(s) provided guidelines or recommendations derived from the results of their study. The recommendations were categorized into three types. The first type includes general recommendations that were not directly related to inclusiveness or accessibility issues; however, their applications can improve both accessibility and inclusiveness. The second type refers to specific recommendations focusing on people with disabilities and explicitly mentions inclusiveness or accessibility enhancement. The third type includes recommendations proposing the use of specific tools focused on inclusiveness. A percentage of approximately 45% of the articles (13 articles) provided specific recommendations, 38% (11 articles) included general recommendations and 17% (5 articles) were referring to the use of tools.
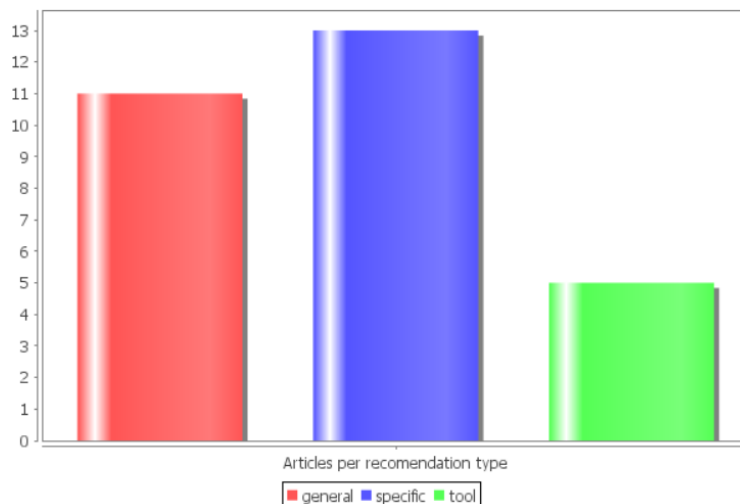
Figure 5: Number of articles according to the recommendations and guidelines proposed.

Even though the number of citations is subject to the date of publication (since very recent publications would not have the same opportunity to be cited), it can be used as an indicator of the impact of an article. Therefore, in Figure 6 the number of citations per article is shown. The most cited article was P26, a review article

published in 2017 concerning LA and universal design, followed by article P15, also a review published in 2020 concerning inclusive learning.

Number of citations
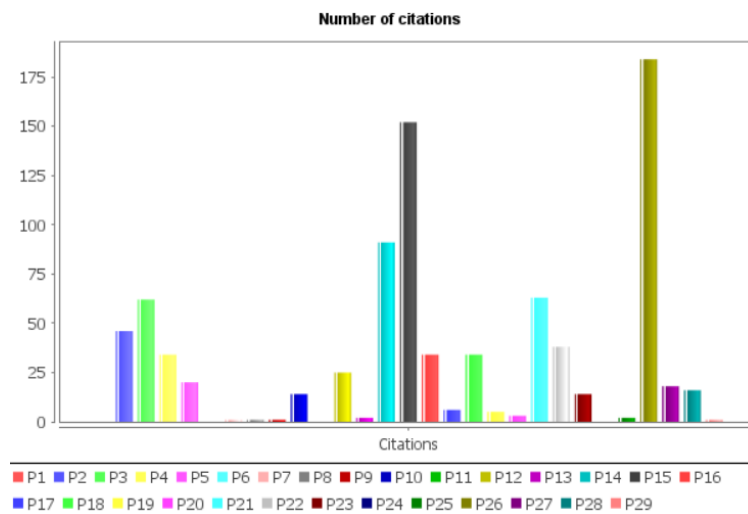
Figure 6: Number of papers that cite each article included in the analysis

It is widely accepted, in the majority of the articles included in this study, that students with disabilities face a wide range of challenges. Additionally, there are barriers and difficulties that students encounter in general. In all of these situations, the inclusive design would benefit numerous students and would improve the quality of education. Technologies designed through the lens of inclusiveness allow wider participation in accordance with the values of open and distance learning. Moreover, apart from technical adjustments and educational material design, methods that strengthen self-regulatory and meta-cognitive skills can also increase accessibility. This design should be based on specific recommendations and lessons learned from diversity. Comparative analysis and the use of multimodal data in combination with demographic characteristics would highlight the barriers that students face regardless of self-reported problems. AI methods are widely used for improving educational settings. However, data should be embedded in AI since currently excluded students experience a vicious circle: they are excluded from learning due to their difficulties, therefore they do not produce educational data and become invisible to AI systems that would finally produce recommendations in adaptive and personalized learning systems, ignoring their needs. Therefore, it is essential to use LA to use diversity and provide solutions for unique cases and extend them to a larger audience. Hence, every institution or organization should address those issues by adopting LA methods in large-scale projects supported by an accessibility team that would enable inclusive and evidence-based decision-making.

5. Conclusions

Openness is an important, yet wide conceptual construction that needs to include the notion of inclusiveness. Inclusiveness does not solely refer to disability. It concerns cultural, economical and gender barriers, ageism and several other situations where people are excluded from an activity or opportunity beyond their causation or control. It is challenging to see these limitations as strengths and use them to improve education for all. Small but steady steps can make a difference by choosing progress over perfection and innovation over compliance. In this study we have highlighted the need to facilitate inclusiveness through the application of LA techniques. The results indicate that the expected benefits of such approaches justify to a large extend the efforts allocated to the investigation of how inclusiveness can be enhanced in different levels by systematic and intelligent analysis of data related to different natural obstacles that learns face.

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7. Apendix

Table 1: Included studies

Number	Title	Citation
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Re-imagining the 'open': Diversity and pedagogies of care for a new era of Open Universities

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Abstract

This paper re-examines the question of future online pedagogies in light of the abrupt shifts caused by the recent pandemic. Given that many 'conventional' universities have started to offer online learning modules on a large scale, the principal challenge for Open Universities is to maintain their prerogative as 'Open' institutions by providing flexibility and tailor-made solutions to their students. The paper argues that accommodating a great diversity of students is more than an organizational challenge for Open Universities, since striving for accessible learning paths requires a deep understanding of students' cultural and pedagogical needs. To that end, it proposes a shift of focus towards student-centered and adaptive strategies that constitute online pedagogies of care. Going against the trend of creating homogenizing modules for massive audiences, this pedagogical orientation places emphasis on a relational perspective of learning which includes concern for the individual participants. According to recent research, three levels of consideration come into play when designing online instruction with pedagogies of care: the pedagogical level, the level of modality and the conceptual level. The paper examines three strands of ODL and offers recommendations for the practical incorporation of pedagogies of care: a) platform design and creating sensitive digital environments; b) synchronous and asynchronous communication, forging authentic ties with students and bridging the transactional distance in digitally-mediated contexts; c) interdisciplinary research for widening the conceptual repertoire of distance learning. The paper argues that in order to tackle the conceptual level we must turn to models of holistic education and draw examples from other, and sometimes paradoxical epistemic allies, such as social anthropology. Placing an emphasis on the human factor of technologically mediated education and recognizing the pivotal role of educators in managing flexible and mobile pedagogies, it supports that social and socioeconomic issues related to inequality, digital and other literacies and cultural specificities need to be empirically and theoretically addressed. Tending to diversity and human needs is not only an ethical responsibility but also a competitive strategy on the part of Open Universities, which need to differentiate themselves from the unprecedented expansion of massive online courses offered throughout the globe by other institutions and organizations.

Keywords: diversity, inclusion, Open Universities, pedagogies of care, interdisciplinarity

1. Introduction: What is it that defines Open Universities today?

From a historical perspective, one of the principal missions of Open Universities has been to address the limited access of certain populations to higher education and to alleviate the pressure exerted by social inequalities

by providing flexible and accessible modalities of studying. Yet social and educational justice are never performed in a social void; they are often subject to social and economic context and more often than not they are greatly affected by dominant discourses about educational policy -but also social theory- in a number of ways. What is more, the cultural role of Open Universities in any given historical moment is determined by the overall educational landscape which also includes the antagonistic and competitive institutions that offer study courses in similar modalities, or in comparable disciplinary areas.

Up until recently, one key identifying characteristic of most Open Universities around the world had been the modalities for delivering distance learning, developed and adopted to cater to the needs of populations unable to partake in full-time face-to-face instruction for various reasons. Existing technologies (from radio to AI) were incorporated, and others specially devised, in order to offer education from a distance, which in turn greatly differentiated the physiognomy of those institutions as more open, flexible and technologically-oriented. This is not the case anymore. Both on the level of instruction as well as on that of pedagogical discourse, it is becoming increasingly difficult to distinguish Open Universities from 'conventional' ones. Europe's urgent steps towards the Digital Transition, as accelerated in many domains by the recent pandemic, has resulted in the explosion of distance learning as a sustainable modality of instruction. Consequently, distance teaching universities are rapidly becoming a limited part of a larger ecosystem of distance learning bodies. On the other hand, a growing concern about inclusive policies in education -ranging from superficial political correctness to profound initiatives for the safeguarding of social justice- have penetrated the common vocabulary of higher education. Where then does that leave the Open Universities? What might be the distinctive characteristics that render them unique, special -and even competitive- institutions in the current state of affairs? The paper argues that a new emphasis on certain aspects of 'openness' might offer a viable and productive resolution of the impasse that ODL is currently facing. More specifically, it makes a case for the cultivation of pedagogies of care in online educational environments and for the practical and epistemological adjustments necessary for a renewal of Open Universities' mission in the near future.

The paper argues for opening up Open Education's alliances with (digital) humanities and social sciences in order to create sensitive and agile learning environments that may refresh the historically distinctive role of open and distance learning. Tending to diversity and human needs on a pedagogical, modal and conceptual level is not only an ethical responsibility in education but also a viable strategy on the part of Open Universities, which need to differentiate themselves from the unprecedented expansion of massive online courses offered throughout the globe (Kop et al., 2011) by various other institutions and organizations.

2. Re-calibrating our priorities: Inclusive, engaging, caring universities

Re-defining the 'open' of Open and Distance Learning in the twenty-first century is not a simple task. There are many alternative ways to redirect our interest, given the recent proliferation of studies and perspectives that pertain to it. However, the shift of contemporary education to problem-solving on a global scale and to acknowledging its potential for socio-political contribution to the 'grand issues' of our times indicate that the main challenge lies in crafting flexible, inclusive and tailor-made pedagogies that accommodate diversity, both in its cultural and in its pedagogic manifestations. Diversity is highly valued as a factor that strengthens social groups and promotes equity and democratic opportunities in formal and informal educational settings. The definition of diversity refers to the inclusion of a wide range of people from different backgrounds, acknowledging their social background, personality, life experiences and beliefs. Some striking examples of diversity include gender, race, ethnicity, socioeconomic, age, cultural, religious, and political diversity,

although the list is much longer and more complex than these identity categories. Given the concept's extremely wide-ranging scope, devising pedagogical theory and practice that acknowledges diversity and strives for inclusion goes beyond strategic proclamations; first and foremost, it calls for an urgent reconfiguration of a university's key priorities and conceptual grounding. These priorities need then be translated into tangible pedagogical design and technical infrastructure, paying particular attention to allowing educators adequate space for tailoring the courses according to the palimpsest of individuals that participate in each module.

Such pedagogies are clearly student-centered and adaptive but above all they ought to demonstrate an actual compassion for the position of each participant and their individual needs and circumstances. How feasible is this in a highly competitive educational and professional market, especially since neoliberalism has been systematically appropriating pedagogical concepts, techniques and terminology from open and distance learning (Demiray, 2017)? Also, how manageable is inclusive and individualized teaching in institutions that do not grant time and recourses to tutors to attend to diverse learning capacities and needs? A potential answer to the predicament that arises might be a turn of distance teaching universities towards what is largely termed 'pedagogies of care'. Even though this relatively recent strand of studies locate their epistemic roots and alliances in various and sometimes contrasting fields, ranging from critical pedagogy (Freire, 2021a, 2021b; hooks, 2013) to gender studies (Warin, 2014) and political ethics (Bozalek, Zembylas & Tronto, 2020), they all underline the priority of motivation, emotional engagement and nourishment of the participants (Dumford & Miller, 2018) as paramount to creating meaningful learning environments and emancipated learners. Similar concepts, like 'educare', derived from Swedish pedagogy, have been shown to serve holistic educational purposes and to have the power to transform professional (gender and other) roles within contemporary education (Warin, 2014). Such concepts ultimately coincide with movements of educators all around the globe who have started to rigorously re-problematize the basic tenets of their practice and support pedagogies of care (Buckley-Marudas & Rose, 2021) and empathy (Calloway-Thomas, 2018). This body of work resists the prevailing demands for productivity and efficiency in education and demonstrates a peculiar 'regression' towards community-oriented learning and strongly draws on anthropological concepts of collectivity, collaboration, and communal knowledge transmission in earlier times and diverse cultural settings (Apostolidou, 2022a, p. 5).

In the sector of higher education, research findings reveal the great correlation that exists between student engagement, perceptions of care, and feeling safe with sustained positive outcomes for students' performance and well-being. Barnacle and Dall'Alba (2017) draw on the work of Martin Heidegger and Nel Noddings and show that efforts aimed at promoting engagement and commitment to learn by students should include developing a capacity to care about others and about common problems. The authors extend the notion of engagement beyond a narrow neoliberal agenda that dominates online education literature and note that challenging and supporting students entails encouraging them to take a stand on what they are learning and, also, who they are becoming. This enriched conceptualisation has the potential to reorient student engagement, especially in online learning (Dumford & Miller, 2018), while enabling students to realise the full benefits that higher education can provide. In this respect, the establishment of inclusive, engaging and caring universities is more than an abstract and somewhat romantic idea, but a very tangible new orientation towards the enhancement of learning and, consequently, the honing of critical, reflexive and engaged citizens.

3.   A pedagogical shift towards caring online: Conceptual and modal considerations

Although educational research on the pedagogies of care has flourished in recent years, most of this research has focused on face-to-face settings, with only a few notable exceptions. Noddings' influential work emphasizes the centrality of care in effective teaching and learning and it is grounded on the position that care is basic to human relationships. Noddings (2003, 2005) defines education as "a constellation of encounters, both planned and unplanned, that promote growth through the acquisition of knowledge, skills, understanding and appreciation" (Noddings, 2002, p. 283) and argues that from the care perspective education needs to embrace the following four key elements: modelling, dialogue, practice and confirmation. Modelling implies that educators need to be concerned with the growth of people as carers and cared-for and they have to actively demonstrate what it means to care. As indicated by studies on the role of mentors (Lunsford et al., 2017), the establishment of these relations is the bedrock of all dimensions of the framework and the ethos embedded in educators' behavior is here of paramount importance. Dialogue, according to Noddings, is an essential part of caring which can further help people to critique and better understand their relationships and practices and to evaluate their own attempts to care. Practice, as an integral part of reflection, entails tasks in which learners are involved in caring apprenticeships within or outside educational environments; it also entails acknowledging and putting to use a certain mentality that is the result of the experiences in which we immerse ourselves. Confirmation is seen as a constant encouragement and affirmation of the positive aspects of others, which only works when educators get to know their students and other participants reasonably well.

It may be argued then that caring entails the deeper understanding and constant fostering of social interaction. Research on the social aspects of interpersonal engagement and interaction online are paramount in performing care and in building trusting and emancipatory relations with students, both in synchronous and asynchronous communication settings. With reference to online settings, this essential learner-educator interaction is mediated through two important 'obstacles': on the one hand, the educational material, that plays the role of the principal teacher in distance learning and, on the other hand, the technologies though which interaction with peers, educators and instructional material takes place. Given the inherent problem of transactional distance posed in distance learning contexts (Moore, 1993), which increases the psychological separation between the teacher and learner, also defined as "the distance in understanding between teacher and learner" that affects the interpersonal relationship between them (Giossos et al., 2009), the development of strategies that place emphasis on care is almost a common-sense proposition for ODL. At the same time, it becomes a considerable 'thorn' for online learning, since the abstract concept of care needs to be taken into account on an interpersonal as well as a learning design perspective. How then is care performed online and how are Open Universities in a position to make use of its benefits?

In their systematic research, Henriksen et al. (2022) draw on the work of Jerome Bruner (1996) on folk pedagogies to offer us a model for care in online education. According to Bruner, folk pedagogies constitute a taxonomic model for understanding the grounded knowledge and for including the implicitly-held theories, beliefs, assumptions or biases about the nature of learning, as held by teachers and learners. The authors acknowledge the implied binary between the human and the technological, as well as various ensuing tensions, and try to move beyond them to propose new assemblages and creative possibilities that afford care and allow for student agency in a human-centered pedagogical framework. One of their most significant contributions is that, besides the apparent drawbacks that characterize digitally mediated education, they also trace new potentialities for interactions, connections, and embodied knowledge, "especially when oriented to the humanity of each student and directed to their emotional wellbeing, excitement for learning, curiosity, engagement, and immersion opportunities" (Henriksen et al., 2022, p. 76). As they demonstrate, the internet

and digitality have affordances to establish strong human connection, therefore "feelings of disconnection may not be intrinsic to the medium, but an indication of a lack of design for pedagogy of care in online spaces" (p. 77). Because digital technologies as well as education are both very broad concepts, contingent upon context, research indicates that there is no one set of rules for how teaching and learning should look or what educators should do. However, they offer an interesting schema for designing online instruction with pedagogies of care, which involves three interrelated levels: the pedagogical level, the level of modality and the conceptual level (Figure 1).
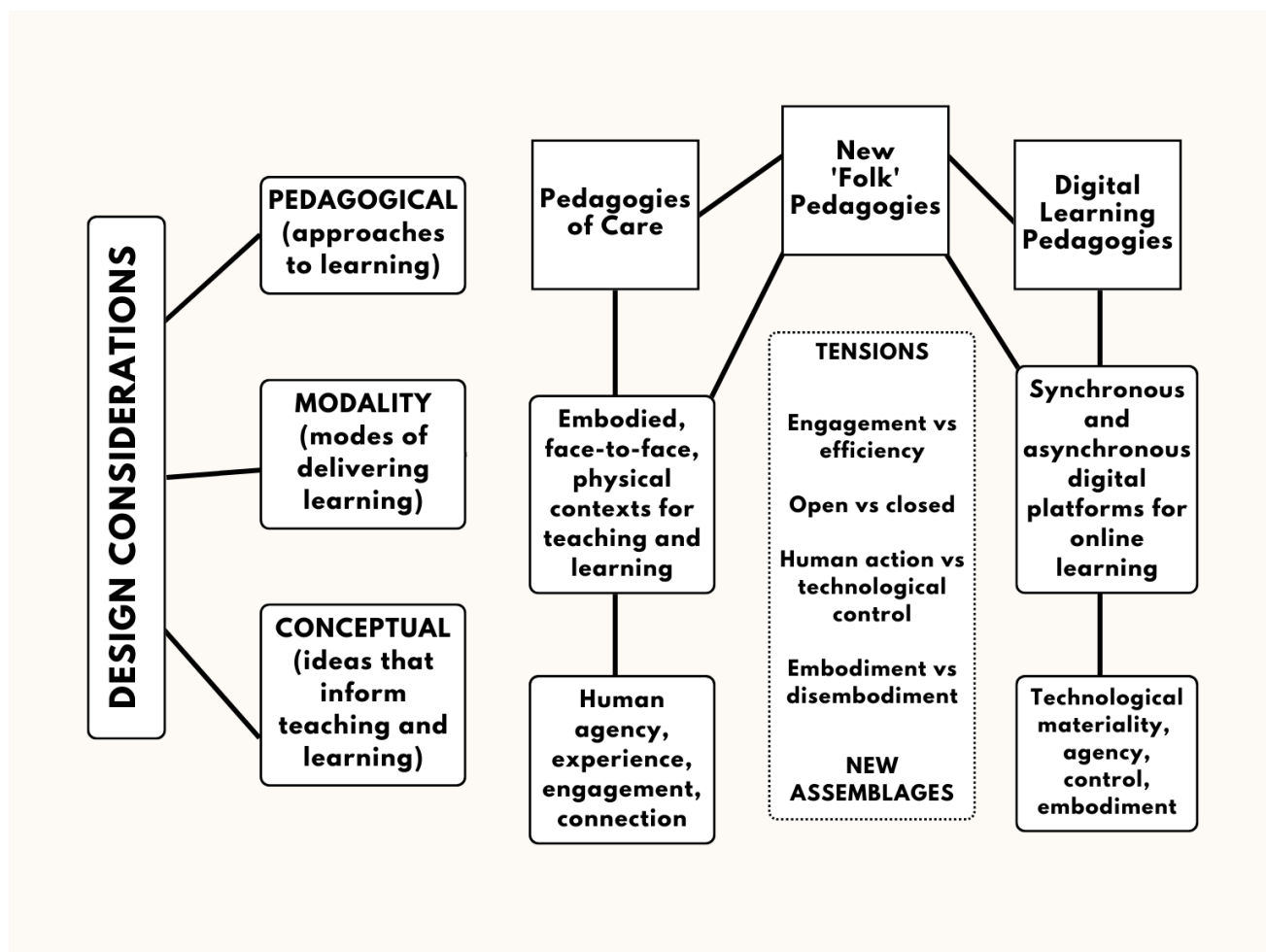
Figure 1: Designing care for online learning (Henriksen et al., 2022, p. 84)

The overall aim of Henriksen et al. is to reclaim many of the current educational narratives around technology and redirect them to considerations for care. As they argue, this reclaiming is needed with respect to many twenty-first century narratives about efficiency, performance, and atheoretical discourses about "transforming" learning to produce more prepared workers. They identify a series of binary tensions that derive from this schema and need to be tackled in practice (such as engagement versus efficiency, open versus closed, human action versus technological control, embodiment versus dis-embodiment etc), which interestingly echo Dron's concerns on the dichotomy between soft and hard technologies in online learning (2014), and they consider the wider implications these may have for educational research and praxis.

Following this interesting schema, in order to re-orient ODL towards pedagogies of care and become the principal provider of such an innovation in education, Open Universities need to redirect their practices on all three levels when designing online instruction with pedagogies of care and consider fresh solutions on the

pedagogical level, the level of modality and the conceptual level. The following section argues that the shift needs to be primarily on the level of philosophy and pedagogical aspirations on inclusive and caring learning (conceptual level) rather than on the level of technological means and applications (modality).

4. Pedagogies of care in Open Universities: Recommendations on three levels

In pursuing innovation, equity and inclusivity in the realm of open and distance learning, Open Universities may consider the concept of open education as one that fosters pedagogies of care in a very systematic and pragmatic manner, and lead the way to a refocus of education towards principles that safeguard social cohesion, individual respect and deep cultivation of the intellectual and psychological aptitudes of participants. The discussion that follows synthesizes recent work on pedagogies of care and interdisciplinarity to offer a set of recommendations on three distinctive areas: a) the generation of sensitive digital environments, b) the priority of fostering caring communication on an interpersonal level, and c) the conceptual opening of online learning to theories and epistemic viewpoints that embrace different disciplinary perspectives and encourage caring education.

4.1 Caring modalities

The field of educational technology has often been shallow in its theorizing of teaching and learning with technology. With digital technologies mediating an explosion of online learning, there is a growing concern about a focus on care and human needs for collaboration, relationships, and wellbeing (Dumford & Miller, 2018). In digitally mediated learning an urgent priority for performing caring pedagogies refers to platform design and the generation of sensitive digital environments (Burke & Larmar, 2020; Slagter van Tryon & Bishop, 2009; Christensen, 2020). Most online courses are a fully designed experience involving technologies, tools, and mediums which have unique affordances and constraints. In enacting a pedagogy of care, it is critical to use the virtual space and design the materials and tasks as opportunities for connection and also to foreground students' voices to allow for curiosity and engagement. This can be achieved by paying attention to access variables of the platforms used to deliver online learning and by taking into account the physical and cultural particularities of different cohorts of students. This may be performed through providing accessibility toolbars, translation and multilingual tools as well as through focused aesthetic interventions to the usually indifferent and somewhat clinical design of online learning management systems.

Apart from the basic built-in affordances of these platforms, the technological component may be enriched with creative use of different media according to the needs of each group of students. This does not necessarily entail the design of an elaborate plan to be effective; but it does require acknowledging the learners as unique individual and group entities that respond differently to different kinds of stimuli. More importantly, it requires acknowledgment of the role of the teacher as both a designer and a spontaneous empathetic presence. Therefore, the implication for Open Universities is to allow time, space and adequate recourses for their teachers to actually include this aspect of their role in the design of learning and not use pre-designed matrixes for all the components of the teaching experience, hence minimizing the territories for performing actual pedagogies of care. Some effective initiatives are offered, such as connecting to the physical and emotional experience of learning as an important component in caring. Finding ways to acknowledge and motivate the physical body and the surrounding space (such as the use of gesturing, sharing visual and aural elements of the room of each student, or involving movement in an otherwise sedentary and passive modality of learning) greatly help create rich and caring mediated environments and minimize the inherent transactional distance. As Henriksen et al. show, online settings have "a unique affordance that teachers do not always engage with— that is learning is embodied from home. With no traditional physical classroom, we can engage in activities

that connect to or use whatever is present at home or in the wider community" (2022, p. 81). This may be also be achieved through funding on the individualized digital experience of each participant, and through the possibility for intervention to the standard format of virtual environments in which learning takes place. For example, the principles and content of a specific course may be incorporated within the learning platform by expressing inclusiveness, multilingual orientation, and differentiated pedagogies in the very technological fabric that mediates learning, e.g. the Moodle platform (Apostolidou et al., forthcoming). In addition, offering optional video-conferencing sessions for care might be used intentionally to connect and engage with students empathetically to strengthen rapport, enhance emotional engagement, overcome ambiguity and foster motivation (Slagter van Tryon & Bishop, 2009).

A broader, timely and urgent concern is the emergent world of growing intersections between humans and technologies, which are elaborated by work on transhumanism and offer a critique of the tendency for privileging human agency in terms of interactions with the material. Recent research findings highlighting that online learning may have a deleterious impact on a student's sense of connection, leading to experiences of isolation and disempowerment, are old news for the literature of open and distance learning. In fact, such ideas form the basis upon which Open Universities have devised their pedagogies throughout the years in order to tackle these inherent manifestations of distance and isolation. Now that a growing body of work is turning to these elements with a renewed interest, due to the proliferation of online instruction and the theoretical coming of age of digital humanities, the next logical step for Open Universities is to invest in this vast pool of evidence, good practices and theories and turn these into a systematic framework for contemporary pedagogies of care. Open Universities might consider adopting more phenomenological perspectives on the adaptation of humans that engulf technologies in their practices and actively engage with questions as to how these online platforms, with complex structures and logical hierarchies built into their software, shape the ways in which we connect, perform knowledge, and embody each other in more caring and creative ways (Henriksen et al., 2022; Apostolidou, 2022b).

4.2 Caring interactions

My second area of interest is centered on rethinking synchronous and asynchronous communication with and between learners, forging authentic ties with students and bridging the transactional distance (Moore, 1993) in digitally-mediated contexts. In face-to-face learning delivery modes this focus on care has been an implicit understanding, built on empathy and closeness, personal contact, embodied presence, and interactions that serve the needs of students in a physical setting that affords social connectedness. Refining the modes in which this can be performed and demonstrated in online environments may be one of the ways for Open Universities to accommodate the social change underway and to position themselves as pioneering institutions for the future.

Recent research on online pedagogies provides evidence that Noddings' four tenets can be transported online. In their reflexive, longitudinal approach of collecting student data over a twelve-year period with qualitative methods, Burke and Larmar (2020) demonstrated how care and even kindness in education have a transformative impact as a reciprocal process between students and educators. The results showed that persistent effort on the part of the educator to convey their 'personhood' in synchronous and asynchronous communication has a positive effect to students and affects their readiness to open up and express their individual values and opinions. This is also facilitated by nurturing dialogue through the online presence of the educator that may support the elements of immediacy and responsiveness. In an expansive outlook of the

much-discussed issue of student support, pedagogies of care offer the stance of compassion, which may be expressed in various ways (e.g., additional consultations, flexible assessment, awareness that online learners will approach their learning with greater flexibility and mobility and assisting in tailoring study approaches for students with unique learning needs) (Burke & Larmar, 2020, p. 7). As far as practice is concerned the authors show that confirmation and transformative learning take place when mutual interaction is fostered through creative use of online technologies. Therefore, the incorporation of non-verbal or multimodal tokens of communication in synchronous and asynchronous learning might be a defining parameter of enacting care online.

Slagter van Tryon and Bishop have further scrutinized the theoretical foundations of enhancing social connectedness in online environments; they refer to this state of social cognition as experiencing "e-mmediacy"– "those feelings of social connectedness one has with fellow online class participants (classmates, instructor, teaching assistant) through computer-mediated communication experiences that simulate the episodic perception of immediacy" (Slagter van Tryon & Bishop, 2009, p. 293). The challenge that is pertinent to e-mmediacy is the cultivation of a holistic mindset that privileges students' feelings, viewpoints and experiences and a genuine desire to hear, understand and cater to their individual and collective needs in an educational environment.

This strand of thinking is also relevant to online interaction through the cultivation of communities of inquiry and communities of care (Barnacle & Dall'Alba, 2017; Apostolidou et al., forthcoming), which show that it is possible to move from a pedagogy of abundance to a pedagogy that supports human beings in their learning through the active creation of resources and learning places by both learners and course facilitators. This pedagogy is based on the building of connections, collaborations, and the exchange of resources between people, the building of a community of learners, and the harnessing of information flows on networks as is the case in networked and connectivist settings. This resonates with the notion of emergent learning as learning in which actors and learning management system co-evolve within a MOOC (Kop et al., 2011) and where the level of presence of actors on the MOOC influences learning outcomes. In the dilemma between pedagogy of abundance and pedagogy of support, Barnacle & Dall'Alba's study pointed to a maturing of e-learning users; the more experienced they are in networked learning and through MOOCs, the higher is their level of participation. People produced artifacts and created learning networks when confident with the technology and with the topic under discussion, while among new MOOCers there was a higher level of consumption of resources created by others. These results confirm the need that Open Universities need to create facilities to advance the media literacy of their students and enhance their full and empathetic participation so that their interactions with educators and peers may be more caring and manifest empathy through the use of diverse media and modalities.

In alignment with the pedagogies of hope and pedagogies of the heart (Freire, 2000[1970], 2021a, 2021b) long fostered by critical pedagogies for conventional education, the proposed shift to online pedagogies of care involves educators and students to an equal degree. If such pedagogies are to be acknowledged and supported in the context of Open Universities, special attention needs to be paid to the care of the caretakers, i.e. the teachers and facilitators. Although research on care in classrooms has flourished, and to some extent it has addressed this issue, there are very few explorations of care as it is experienced in online learning. Rose and Adams's work constitutes an exception which offers a phenomenological inquiry on postsecondary instructors' interactions and relations with their students centered around the concept of care. The stories shared by instructors highlight the extremely demanding and time-consuming aspects of care in the part of online instructors, and bring forth the tension that consequently arises between care for the students and self-care

(Rose & Adams, 2014). The time and energy required for the design and performance of caring pedagogies needs to be taken into account as an integral part of the teacher's role, equally contributing to learning as their academic preparedness. Creating and sustaining caring interactions is a complex and consuming enterprise for educators, therefore institutions ought to offer them special training and adequate recourses to stand up to their role as educational caregivers.

4.3 Caring conceptualizations

Turning to care is ultimately about a conceptual recalibration, more than anything else. It is about grasping the task of online instruction differently and trying to re-imagine its purpose, content and applications. In order to tackle the conceptual level of care, Open Universities could turn to models of holistic education (Miller, 2019) and draw examples from other, and sometimes unexpected epistemic allies from the humanities and social sciences. The model of a holistic education is also suggested as a form of pedagogy of care, which coincides with the recent systems view of online learning. This theory, developed by Moore and Kearsley (2011) examines processes, technologies and the human factor as a holistic system of pedagogical and philosophical considerations rather than as a piecemeal model of remote information delivery. Specifically, Moore and Kearsley suggest that a distance education system contains subsystems, which are themselves embedded in larger systems. They thus liken distance education to a human body, which includes complex biological subsystems, while at the same time being part of larger social systems. Pedagogies of care take into account this inherent complexity and Open Universities may profit from expanding their research towards more sociological and anthropological perspectives towards a more holistic and meaningful education.

Given the growing significance of the human factor in technologically mediated education, and recognizing the pivotal role of educators in managing flexible and mobile pedagogies, we argue that social and socioeconomic issues related to inequality, digital and other literacies and cultural specificities need to be empirically and theoretically addressed. To that end, it is important to cultivate an epistemological dialogue between online instruction and digital humanities in order to address the diversity of local communities and their technological and cultural specificities (Apostolidou, 2022a). For example, social anthropology's focus on diversity offers a fruitful vantage point from which to venture yet another new era for Open and Distance Learning. Social anthropology and a sustained dialogue of educational research with the humanities and the social sciences may contribute to an ethical interrogation of our theories, pedagogies, and practices in the blended and often hybrid landscape of digital education (Apostolidou, 2022a, p. 8). Turning to care entails an expansion of our notions and our vocabulary to include terms that, in the goal-oriented narrative about efficiency and performance, may at first appear 'soft', 'unscientific', or even passé. Much like care, other notions have re-entered the vocabulary of education in relation to learning environments. Miller's theory on soulful pedagogy (Baraei, Mahram & Varaki, 2021) or approaches on compassion have recently been argued as key concepts in pedagogical theory from a number of perspectives (Peterson, 2017; Wilde, 2013; Gibbs, 2017). Compassion for others (a concept that is present in nearly all cultures and spiritual/contemplative traditions) and self-compassion (being open to and moved by one's own suffering) is an indicator of civic responsibility and gives rise to altruism, generosity, social connectedness and kindness towards oneself and others (Gibbs, 2017, p. 229). Perhaps all these efforts point towards a fresh definition of profitable education, one that acknowledges the need for both material and non-material components in the process of learning.

One such recommendation is the integration of elements of a soulful curriculum, which attempts to find ways for identifying students' talents (Miller, 2019). "Using soulful elements, such as meditation, imagination, contemplation and presence in the curriculum has many positive effects such as decreasing teachers' and

students' distress, increasing concentration, enhancing safe interpersonal relations, raising awareness of self and others, truly encountering negative feelings, increasing positive feelings such as joyfulness and passion, decreasing addictive and destructive behaviours, improving career, sport and educational performance, motivating, and increasing creativity and positive change in the brain structure" (Baraei, Mahram & Varaki, 2021, p. 451). Avoiding fragmentation and standardization is a significant part of this curriculum and it should be taken into account when designing highly standardized learning components in open and distance learning.

As multidisciplinary and transdisciplinary research becomes all the more central in our preoccupations, as the arts are entering the temple of positivism (for example, by the incorporation of the A=Arts in the acronym for STEM education=STEAM) a strong alliance with the humanities may help us devise a pedagogical system that fosters care for the positional specificities of learners and at the same time refreshes the social and historical relevance of a soon to be extinct domain of study, that of ODL. There is an acknowledged need for transdisciplinary approaches to the paradigm shift to digitalised education, combining educational knowledge with social anthropology concepts and methods; recent research proposes anthropological approaches to digital education in terms of methods and theories, seeking to bridge the gap between rapid technological progress and the learning and social needs of future students (Apostolidou, 2022b). Re-visioning educational contexts —institution, classroom, teachers, and students— through epistemologies of situated knowledges brings out the multiplicity of contexts and acknowledges the individuality of knowers (students and teachers) and the production of various knowledges (Apostolidou, 2022a, p. 8).

5. Conclusions

The neoliberal narrative on the profitability of education which focused on efficiency and minimized the humanistic goals of education has been gradually collapsing (Mehta et al., 2020), especially in view of the grave effects it has had on a societal, environmental and political level. Paradoxical as it may seem, turning to care is at once an ethical and a profitable disentanglement from the predicament caused by the sweeping digitization of education. This shift demonstrates a profound understanding of the critical stage that we are faced against, while re-instating Open Universities as a key component in a competitive educational landscape, wherein higher education institutions are obliged to look after budget and finance as well as pedagogical and social contribution. However soft this approach may sound, in terms of privileging care over other, more antagonistic and marketable concepts, I strongly believe that the overall result of such a strategic readjustment could be not only beneficial for students and educators but also quite profitable. Regaining a distinctive 'edge' over other distance learning institutions and programs and generating a culturally, environmentally and psychologically sensitive mindset could improve student engagement and performance, social inclusion and equity as well as a higher demand for the services of Open Universities. This balance between pedagogical refinement and economic viability is also mirrored in the students' motivations and beliefs vis-à-vis going to the university. As Nel Noddings observes, "on the one hand students believe that education encourages virtue, good citizenship and a full personal life; on the other, they believe that the purpose of education is economic well-being and, because that is all-important, they are justified in distorting the first set of aims. Held in balance, these aims need not be contradictory" (Noddings, 2012, p. 779).

The broader question of the meaning and mission of Open and Distance Learning in the digital era may be addressed by opening up the pedagogical and epistemological spectrum of ODL to the humanities and the social sciences. Soon there will be no defining characteristic through which Open Universities and other higher education institutions can be told apart. Technologies of AI and algorithmically-driven models will make such distinctions obsolete and the very idea of 'distance' a concept devoid of meaning. In order to maintain a

prerogative on education as distinctive institutions and to resist being wiped out by this sweeping transition, Open Universities may embrace pedagogies of care and support rather than devise cutting-edge technologies to accommodate the change. This paper proposes taking a step back to look at already existent educational models which derive from observing how human communities learn and to invest in identifying, cultivating and making use of pedagogies of care. This re-imagining may be performed on the level of modality and the creation of sensitive digital environments that endorse diversity in its material and technological facets; it may be achieved through accentuating the role of caring interaction between participating humans, and a wider view of pedagogy as a reflexive and empathetic enterprise; it may also be cultivated through a conceptual shift towards pedagogical and educational 'solutions' that come from disciplines seemingly far away from (conventional and online) education. To that end, social anthropology and other disciplinary fields from the humanities and social sciences might offer analytical and methodological prisms through which to assist this transition of focus and to make Open Universities relevant in the learning ecosystems of the future.

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The challenges of social recognition and information for students with functional disabilities

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Abstract

In France, the number of disabled students (according to the World Health Org. definition) pursuing higher education in public institutions rose to 16,000 in 2013 (5,000 in 2004). Ninety per cent of these students were enrolled at university and received support or monitoring as such. More than half of them (54.2%) get human assistance, more than three quarters (77.9%) have their exams adapted.

Accessibility is a legal principle. The principle of accessible education is to ensure that all practices and functions of the university comply with the stipulations and the spirit of the EU's directives on the accessibility of the websites.

The **Adaptations for students** may concern student life, coursework or examinations. In France, the *Summary of the FIED member universities practices* gives an overview of what is being done about technical and pedagogical adaptations. **Technical adaptations can be**: lifts, access ramps, parking access badges… Some universities help students by providing them with suitable materials (digital pens, magnifying glasses…). They adapt the right materials for their platform especially: audio and braille materials… A buddy system can be implemented: a disabled student can be guided by another peer who can help him.

Despite the efforts, the students concerned are faced with **three challenges:**

- *The fear of declaring oneself "disabled"* and the detection of these students. Through a record of the French Conference of University Presidents (la parole aux acteurs, 2014), students reveal the difficulties they encounter, namely the fear of declaring their disability or simply talking about it. The problem of the student's declaration is a societal one.

- *Social and academic inclusion.* Technical tools are necessary but not sufficient. Human mediation has a crucial role to play. In Spain, there is a big gap in the access to university. Students with disability don't have access or don't imagine that they can get access to university like regular students.

- *Lack of information and training of teachers*. According to these students' statements (La parole aux acteurs, 2014), even if they wanted to identify themselves, some of them still suffer from a lack of information at the university. They explain that, very early in their approach, the upstream orientation towards the specialized actors, the search for the right people to contact and the suitable locations to find are very practical issues they are confronted with.

Possible solutions. The problems of social recognition are still present. We propose possible solutions.

- o **Involving disabled students with other students by conveying positive values**, exchanging information on professional, sports and community projects;
- o **Proposing a program of awareness-raising activities for students through conferences**;
- o **Making teachers aware of disabilities** (better understanding of visible or invisible disabilities…);
- o **Implementing agreements with associations**;
- o **Disseminating feedback more widely from former students and good practice guides**.

Accessibility remains a real challenge for all people involved. The challenge is no longer legal or institutional but societal and the answers cannot only be "technical".

Introduction

In France, according to the definition of the World Health Org., the number of disabled students pursuing higher education in public institutions rose from 5,000 in 2004 to 16,000 in 2013. Ninety per cent of these students were enrolled at university and received support or monitoring as such. More than half of them, that is 54.2%, get human assistance, more than three quarters namely 77.9% have their exams adapted.

In Europe for all students Accessibility is a legal principle. The principle of accessible education is to ensure that all practices and functions of the university comply with the stipulations and the spirit of the EU's directives on the accessibility of the websites and mobile applications of public sector bodies and the Non-Discrimination Act.

A student has the right to expect that the university staff aims to provide a learning environment that is socially, psychologically and physically as accessible as possible.

Moreover, communication and materials related to students' admission, teaching and studying as well as administrative rules and regulations must be accessible. Sometimes according to legislation, asking about students' disabilities or registering them are not allowed for instance in Finland. It is always the student's own responsibility to inform the staff about their special educational needs or disabilities. Staff members can only inform students about their rights and the support services that they can be offered.

However, students must register themselves to obtain the status of disabled students. In France, once enrolled, they must follow a clearly established procedure. The Ministry of Higher Education encourages each university to follow a specific procedure which generally is:

- o Interview with the Student Life & Disability Office;
- o Appointment with a doctor from the Student Health Centre;
- o Accommodation granted by the Plural Disability Commission of the institution;
- o Communication of accommodation to components for implementation;
- o Follow-up with the component and in particular with the disability referents;
- o Adjustment in tuition fees to encourage students to have their disability recognised.

The Adaptations for students may concern student life, coursework or examinations.

In France, the Summary of the FIED member universities practices gives an overview of what is being done about technical and pedagogical adaptations. Technical adaptations can be: lifts, access ramps, parking access badges… Some universities help students by providing them with suitable materials (digital pens, magnifying glasses…). They adapt the right materials for their platform especially : audio and braille materials, Audiobooks instead of textbooks specially for maths or statistic; Subtitles are added to videos.

The **use of human resources** can concern, for instance, the implemention of a buddy system. A disabled student can then be guided by another peer who can then help him in certain situations.

Actions can be put in place for teachers to ensure inclusion in their **teaching practices**.

At the beginning of their studies, students must be informed about the possibility to have some individual arrangements. They could get a document about the recommendations for individual arrangements. These individual arrangements could be:

- o Alternative study materials;
- o Alternative study modes;
- o Alternative study modes;
- o Getting lecture materials/slides in advance;
- o Possibility to record lectures if recordings are not otherwise available;
- o Extended loan period for course book loans.

Support for teachers based on pedagogical guides

To assist teachers, the Université de Poitiers (FIED-France) develops a *pedagogical and on-line exam guide*.

Others developed a Manual of pedagogical guidelines (UTPL, 2020) for inclusive practices in order to respond to the educational needs of different groups of students with special needs. It orients the curricular adaptations of first and second grades, known as non-significant. In terms of methodology, it suggests using specific methods and resources, adapting the organization of the classroom and the level of complexity of the class. Other suggested areas are directed to the evaluation of learning with the adaptation of techniques and instruments or the evaluation criteria.

The Examinations can also be adapted:

- o Additional time during the exam session and/or when returning written tasks;
- o Adaptation of tests; use of adapted equipment (Braille displays; foreign language keyboards, etc.);
- o Individual exam-arrangements with e.g. the permission to type instead of handwriting;
- o Impunity for spelling or grammatical errors;
- o Composition in a private room with a school life assistant;
- o Support of personal assistant;
- o Assistance of a sign language interpreter or a secretary who reads scripts;
- o Allow access to various personal aids or (computer) programs;
- o Use of a laptop computer that has been emptied;
- o Transmission of subjects in an adapted format (A3 format, line spacing, bold font, etc.);
- o Authorization to take a break for tests lasting more than an hour and a half;
- o Taking examinations in a different location or in a dedicated room.

The challenges

Despite these efforts, the students concerned are faced with **three challenges**:

- *The detection of these students*. Through a document of the French Conference of University Presidents (la parole aux acteurs, 2014), students reveal the difficulties they encounter, namely the fear of declaring their disability or simply talking about it. For these students with functional disorders, perhaps 20-25%, might not wish to register as such. Difficulties arise in the curriculum and organizational adaptations are then made later in the year or even too late. Furthermore, trying to focus too much on the different forms of disabilities may accentuate fears.

Beyond the actions carried, the problem of the student's declaration is a societal one.

- *Social and academic inclusion*. Technical tools are necessary but not sufficient. Human mediation has a crucial role to play. In Spain, there is a big gap in the access to university. Students with disability don't have access or don't imagine that they can get access to university like regular students. Students with disability have to be promoted and empowered. There are mainly psychological or social issues which can be family-

related ones. Sometimes, a person with disabilities can't have access to some studies or trainings because teachers think they can't achieve or develop all the competences.

-*__The Lack of information and training of teachers__*. Students explain that, very early in their approach, they are confronted with the upstream orientation towards the specialized actors, the search for the right people to contact and the suitable locations to find.

In France, students consulted by the Conseil National du Handicap and the Mornay Group, criticize the unawareness of teachers about disability. Students with disabilities feel the lack of interest of some teachers which can be explained in two ways. It can be voluntary, the student is treated like the others except for compensation. Or the disinterest can be the consequence of the teacher's lack of awareness.

Possible solutions.

Under the impetus of new regulations, the constant effort of universities and staff to facilitate accessibility has created an active and prolific ecosystem (rectorates, associations, teachers, students, public or private companies).

In this respect, the good practices of universities are technical and human.

The problems of social recognition are still present. Possible solutions can be suggested.

As the problem of the student's declaration is a societal one, the main solution is to carry out awareness-raising actions among the youngest schoolchildren, high school and university students, teachers, and institutional leaders. Similarly, the solution to the lack of information and training of teachers is to encourage awareness-raising and information activities such as:

- o **Involving disabled students with other students by conveying positive values**, exchanging information on professional, sports and community projects and attitudes towards disabled people;
- o **Proposing a program of awareness-raising activities for students** through conferences, sporting events for disabled people, and the participation of "disabled-minded" companies;
- o **Making teachers aware of disabilities** (better understanding of visible or invisible disabilities, how to adapt their behavior and communication according to disabilities);
- o **Implementing agreements** with associations, education authorities and high schools (transfer of information to high school students, etc.);
- o **Disseminating feedback more widely** from **former students** and good practice guides on the universities' internet platforms (personalized procedures and contacts for registration, present the approach when welcoming disabled people, communicate on the accessibility of rooms, digital accessibility, teaching schedules, etc.).

Conclusion

Accessibility remains a real challenge for all people involved. The challenge is no longer legal or institutional but societal and the answers cannot only be "technical".

The major challenge is the detection of the students concerned and more specifically their real and immediate identification, for instance the acceptance of the identity of disabled student as such. Too many students do not wish to identify themselves socially as disabled students. The challenge is no longer legal or institutional but societal and the answers cannot be only "technical".

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Access to Online, Open and Distance Education for Refugees

A tutor-facilitated online training community of in-service teachers: challenges and expectations in the post-COVID19 era.

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Abstract

In this paper we present findings from research conducted in the context of a large-scale training programme for teachers working in educational environments for students with refugee and migrant backgrounds, in Greece. In an effort to assess the quality of the training provided, and the satisfaction of both trainees and tutors, we organised a survey, conducted through questionnaires and five focus group discussions, with an audience of 36 trainees and 8 tutors. Our research questions revolved around a) the experiential character of the program, and its connection to actual teaching practice and b) the sense of community built among participants with different roles within the program.

Our findings indicate that important factors of an effective online teacher training are related to individual, interpersonal and professional skills of the tutors and trainees involved, to the quality of learning materials available and the meaningfulness of feedback, and to key components of the community of practice, such as engagement, (in)visibility and solidarity, especially for in-service teachers working in educational environments with vulnerable social groups.

We also discuss the consequences of two years of the COVID-19 pandemic, and a sharp increase in online training experiences. In the surveyed community of trainees and tutors, it is clear that the new normal increasingly involves distance and online learning. But alongside convenience and economy of online trainings, there is an emerging demand for specific and consistent quality criteria for the delivery of online training for teachers.

Keywords: inclusive education, teacher training, online learning

1. Introduction

Education for refugee and migrant children in Greece remains a challenge, despite significant efforts and initiatives over the past decade. Building on previous years of joint efforts, the Ministry of Education and Religious Affairs, the Ministry of Migration and Asylum, and UNICEF Greece launched, in mid-November 2021 a national programme to enable all refugee and migrant children to access quality learning. The project "All Children in Education" (ACE) aims at ensuring a pathway to formal education for every school-age refugee and migrant child. Towards this goal, through ACE, and complementing previous and existing efforts (Teach4Integration I & II), UNICEF Greece Country Office is collaborating with the Institute of Educational

Policy (IEP), and selected Greek universities to implement a holistic teachers' capacity building programme on inclusive education, intercultural education, Greek as a second language, digital education and the Accelerated Learning Programme, and other relevant topics (Teach4Integration III, T4I3). The GLML-T4I3 project is funded by UNICEF and implemented by Greek Universities, led by the University of Thessaly. The project is ongoing, expected to reach about 6.000 teachers and other education-related staff in three successive school years (2021-2024).

In this paper we specifically focus on the GLML-T4I3 project, organized by the Greek Language and Multilingualism Laboratory at the University of Thessaly. During the academic year 2021-2022, 734 teachers of all levels of education attended GLML-T4I3, divided into 18 trainee groups based in 16 different cities in Greece. A hybrid model was chosen for the trainings, but the trainee groups also had a continuous online presence and activity, on a customized Moodle LMS, under the coordination and supervision of qualified appointed tutors (one tutor responsible for each trainee group).

2. Background

2.1 The content of the program: addressing the theory-practice gap
A basic shared view informing the rationale of GLML-T4I3 was the importance of the critical role of teachers in inclusive systems in and around school (Downes et al., 2017). Inclusive practice is all about the things that teachers in schools *do* which give meaning to the concept of inclusion (Florian, 2008). With European teacher population still remaining homogenous in increasingly diverse schooling environments, teachers lack experience and awareness about the multi-dimensional diversity of their pupils and are consequently limited in their ability to effectively deliver subject matter and include intercultural education content (Agirdag et al., 2016, in EC, 2017).

International evidence points towards achieving social inclusion in education and society through the use of *practical tools* by policy makers and school actors (Downes et al., ibid). This need is further accentuated by the SIRIUS Network 2019 national and regional roundtables report, calling for the training of teachers to address the challenges of multilingual classrooms.

However, despite the growing knowledge base coming from international standards, frameworks or guidelines on inclusive education, the Council of Europe (2015) cautions against putting all these in actual practice, as so far, much emphasis has been put on what teachers need to know, feel or believe in, and less in *what they do or don't do everyday in their classrooms*. This gap between theory and practice remains a persistent one, having been repeatedly identified in the current professional development debate on issues of inclusion. Despite formal decisions in favour of inclusion, there are numerous examples from several countries, where there is a gap between formulations and realizations of inclusive education, as tension and resistance because of lack of coherence and competing interests affect implementation (Haug, 2017).

The Council of Europe (ibid.) argues that both teachers' competency and TPD programs' effectiveness depend on their impact on teacher practice. For this to operationalize in concrete activities, teachers need to activate specific sets of competences, beliefs and skills in four areas of practice, in relation to:

- students
- the curriculum
- collaboration with others and
- the development of teachers' own professionalism

These are, in a nutshell, the four broad areas that underpin the design and rationale of the GLML-T4I3 training program. The program has a nine-month duration and includes the following thematic units:

1. Introduction to the program – The educator as a micro-researcher

2. Identities, migration and the refugee issue

3. Educational and Language policies, multilingualism

4. Phycho-social support for migrant and refugee students

5. Methodology of teaching Greek as a second language. Selection, development and classroom use of educational materials

6. Greek as a second language: general pedagogical principles and applications

7. Inclusive – Intercultural education

8. Strategies for differentiated learning and teaching

9. Grammar and vocabulary in teaching Greek as a second language

10. Managing intercultural classrooms – Personal and professional development of teachers

11. Teaching non-language courses and Content and Language Intergated Learning (CLIL), Accelerated Learning Programs (ALP)

12. Distance education and hybrid education for vulnerable groups

During the program, trainees can select among 4 written assignments -two of which involve the implementation of a learning scenario in their classrooms- and 22 asynchronous activities (varying from brief position texts, to forum discussions and commenting on videos or texts). They also have the chance to attend 4 two-day training sessions with trainers (face-to-face and online, as was the case during 2022 due to the pandemic) and 4 two-hour support online sessions with tutors.

2.2 Social orchestration within the program: investing on community

In service teachers willing to seek inspiration and new ideas for their practice often do so through formally-provided courses, seminars and post graduate programs (Lantz-Anderson, Lundin & Selwyn, 2018). In parallel, many teachers also engage in "living professional development", employing several ways of informal learning, as for example, discussions with colleagues, personal web search or participation in online teacher groups and networks (Laurillard & Masterman, 2010; Lantz-Anderson, Lundin & Selwyn, ibid.). Whatever the nature and status of the community (formal or informal), the concept has gained momentum in TPD research and practice, on the basis of several benefits: collegial dialogue and ideas exchange, dissemination of innovative practices, reflection on teaching and moderation of teacher isolation (Fontainha & Gannon-Leary, 2008; Wenger, White & Smith, 2009; Ribeiro & Kimble, 2008). Especially the latter, teacher isolation, intensely troubled the educational community during the COVID-19 pandemic and recent lockdowns (Song et al, 2020; Gruber & Bower, 2020). In fact, the interest around virtual Communities of Practice (CoPs) has been greatly revitalized during this period, as a response to Covid-19 challenges imposed on teachers (Bolisani et al. 2020).

Meanwhile, the rapid proliferation of easy-to-use technologies, even for inexperienced educators, over the past years, makes it easy for teachers to immediately set up and join online spaces. However, technology alone is not enough for weaving actual relationships and collaboration among teachers online. All higher education institutions (often also official teacher training providers) host or use a Learning Management

System (LMS), which, though, is not enough as a community space, often reduced to functioning solely as a repository of materials (Laurillard & Masterman, 2010). Many training programs include a "community module", predominantly in the form of a discussion forum, which tends to be under-used during the program, and to totally fade out after the program officially ends (Misanchuk & Anderson, 2002). This can be attributed to the fact that when something is imposed to teachers "top-down", without their active contribution to innovation, they strongly resist it (Kynigos, 2003; JRC, 2009; Hamlaoui, 2021). A way to address this issue is through bridging formal education training provision with the informal character teachers learn and develop, and exploiting the dynamics of the latter (Jenkins, 2006). In practice, this can be achieved through purposeful moderation of community interaction and communication by experienced, trained moderators (JRC, 2009). This is though rarely achieved in practice, and as a result, we have sparse empirical evidence for such teacher communities (JRC, ibid.), highlighting the need for synergies among researchers and teachers - practitioners (Najafi & Clarke, 2008).
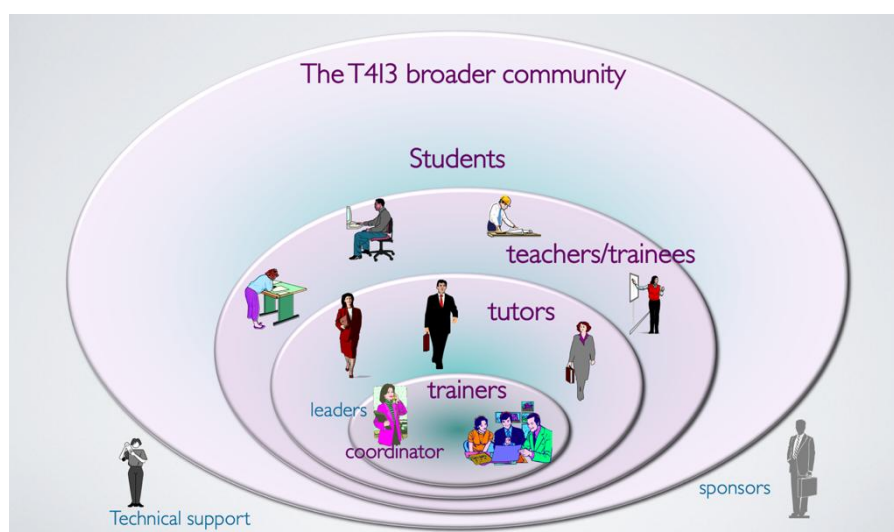
Figure 1: The GLML-T4I3 broader community (based on Wenger and Trainer's slide, available at: https://www.wenger-trayner.com/slide-forms-of-participation/, with licence for re-use)

Within GLML-T4I3, we have envisaged the type of community described above, including 5 levels of participation (beginning from the core group): the coordinator and the trainers, the tutors, the teachers/trainees and the students (not as direct participants, but as immediate beneficiaries). All levels have distinct, but complementary roles: the coordinator leads the scientific committee of trainers, including 12 trainers who are also organisers of each thematic unit and leaders of a group of other trainers who offer face-to-face (and online) training sessions. All trainer-leaders have a strong academic background with expertise in different aspects of inclusive/intercultural education, being university professors. The tutors play a hybrid role, mediating between the trainers and the trainees. They support trainees, mediating content (in collaboration with trainers), answering questions and addressing issues and providing feedback to written assignments. They are of a varying background: practicing teachers with graduate degrees, teacher educators, junior and senior educational researchers and academics. This allows for establishing rapport with in service teachers, as well as ensuring a good level of experience in training settings.

3. Methodology / research design
We implemented a mixed methods approach to investigate the following research questions:

1) Did the program (and to which degree) tackle the theory-practice gap through addressing the needs and actual experiences of participants?

2) How did tutors and trainees envisage their role as members of the T4I3 community of practice?

To answer these questions, on a first level, we drew data from *selected* axes of the program evaluation questionnaires, covering a range of aspects of the online (synchronous and asynchronous), as well as face-to-face participants' experiences. 390 questionnaires were filled in by participants from 4 to 13 April 2022, covering about 53% of total participants (in all universities, the total of train). From the full range of aspects evaluated, we chose to focus on those mostly related to the theory-practice gap and the sense of community, as indicated in table 1 below (the axes we focused on are highlighted in bold characters):

Table 1: Selected axes from the questionnaires

Satisfaction from program participation
Information regarding the program, goals and expected results
Organization of the program
Duration of the program
The combination of synchronous and asynchronous education
Number and duration of synchronous meetings
Platform functionality
The educational material of the program
Trainers offer encouragement and support
The adequacy of the trainers
I feel comfortable to express my questions, experiences, opinions and disagreements
There is encouragement of participation, teamwork and dialogue
There is a sufficient link between education and the needs and experiences of the participants
The program fulfills my training needs
Level of fullfillment of expectations from the program
Refugee education in different educational contexts
Classroom management classes with refugee and mixed class students
Teaching of Greek as a second language
Using different educational techniques with refugee students
Using these techniques also in conventional classes
Affect colleagues for accepting refugee students
Choosing and creating educational materials and activities
Emphasis on practical issues and on everyday educational practices
Presentation of case studies and good practices
Meetings based on participatory and experiential approaches
Emphasis on the rights of children and the living conditions of refugee children
Emphasis on Differentiated Teaching
Emphasis on issues of intercultural education
Platform evelution
The activities and materials of the platform contribute to the completeness of my education
Through the platform the degree of my involvement and interaction with the team increased
The online platform is user-friendly and compatible with my knowledge and skills
There is technical support for the platform
The process of distance learning is convenient for me

On a second level of analysis, we employed the technique of focus group discussions, as we wanted to exploit their augmented potential for interaction based on group dynamics (also known as "the group effect"), which is also what differentiates focus groups from individual interviews, where participants may be less prone to explore and clarify their points of view (Liamputtong, 2011.) Focus group discussions took place

in September 2022, after the end of the first year of the program. The participants were 36 trainees and 8 tutors, participating in six focus groups (five with trainees and one with tutors) and selected from the pool of 734 trainees and 18 tutors from GLML-T4I3 program. The discussions were organized around 6 axes, from which, in this paper, we focus on those specifically related to the theory-practice gap and community.

Table 2: Focus group axes and questions

Axes		Questions
1.	Trainees' expectations and degree of fulfillment	**1.1** Reasons for participating in the program **1.2** Was T4I3 as you expected it to be? (Yes/no, if no, in what respect(s) was it different than expected)
2.	Program Workload and deliverables	**2.1** What was need on your behalf to fulfill the obligations of the program? (time, effort, new knowledge, new skills).
3.	Community and roles	**3.1. Community** Did you experience (and if yes, to which degree) the sense of belonging to a community of practice during your participation in T4I3? **3.2. Roles** **3.2a Peers (colleagues)** How would you characterize the relationship among you and your colleagues/co-trainees? **3.2b Trainers** What did you think of the trainers? What would you keep in this role and what would you change? **3.2c Tutors** Was the support you got from your tutor satisfactory? What would you keep in this role and what would you change?
4.	Assessment & Evaluation	**4.1** Do you think grades in tasks and activities were a good idea? **4.2** Do you thing written feedback from the tutors was a good idea? What suggestions do you have on the above?
5.	Hybrid model (combination of online and face-to-face learning)	**5.1. Balance between online and face-to-face presence** How did you experience the balance between online and face-to-face presence? **5.2. Experiential character of the program** During the program, did you feel that its character was experiential? (If yes, in which instances -syncronous online, asynchronous online, face-to-face, forum, assignments, engagement with materials). Can you recall an episode/instance, when you either experienced something that moved you as a person, or as a member of a team?
6.	Platform	**6.1** How would you rate your online experience with the GLML-T4I3 platform; **6.2** Where there ways/methods to keep your interest and make your learning experience more pleasant? **6.3** What would you change in the GLML-T4I3 platform?

4. Findings

4.1 A general view from questionnaire evaluation

The interim evaluation through questionnaiers indicated a quite positive view of participants towards the program, with regards to the degree of fulfillment of their initial expectations (Tables 1a and 1b), their overall sense of satisfaction (Table 2) and their overall experience with the platform (Table 3).

Table 1a: Satisfaction from program participation (1)
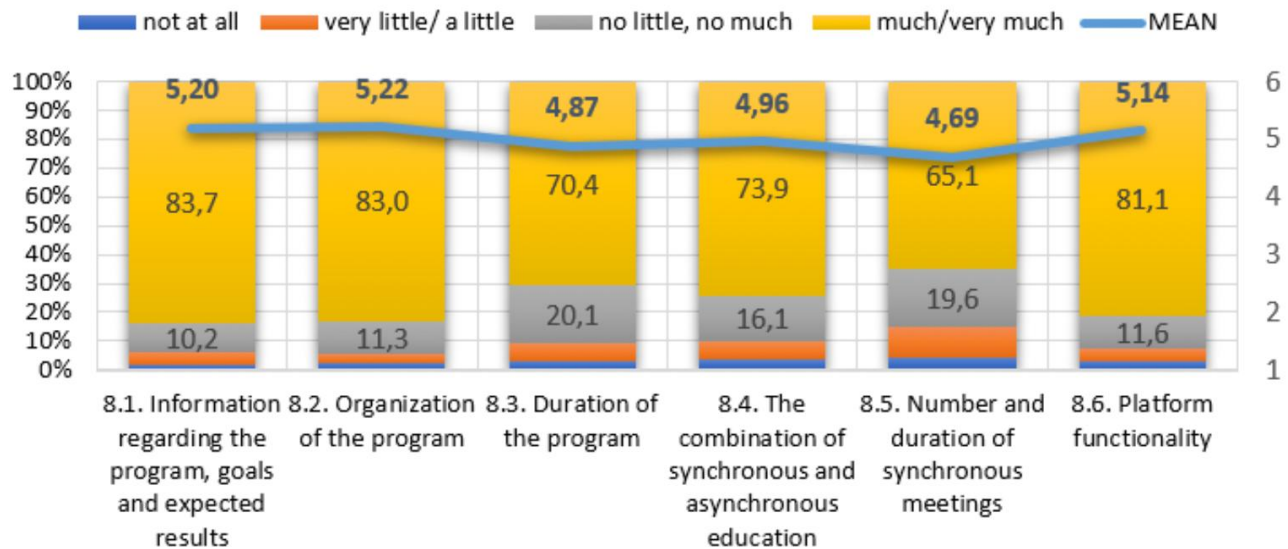
Table 1b: Satisfaction from program participation (2)
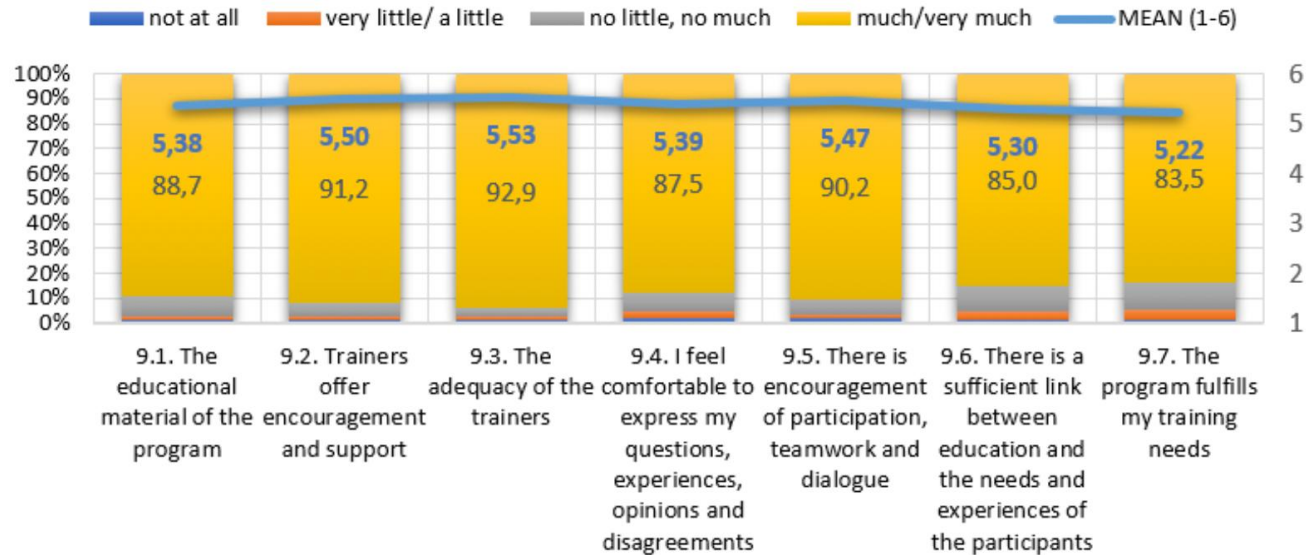
Table 2. Level of fullfillment of expectations from the program
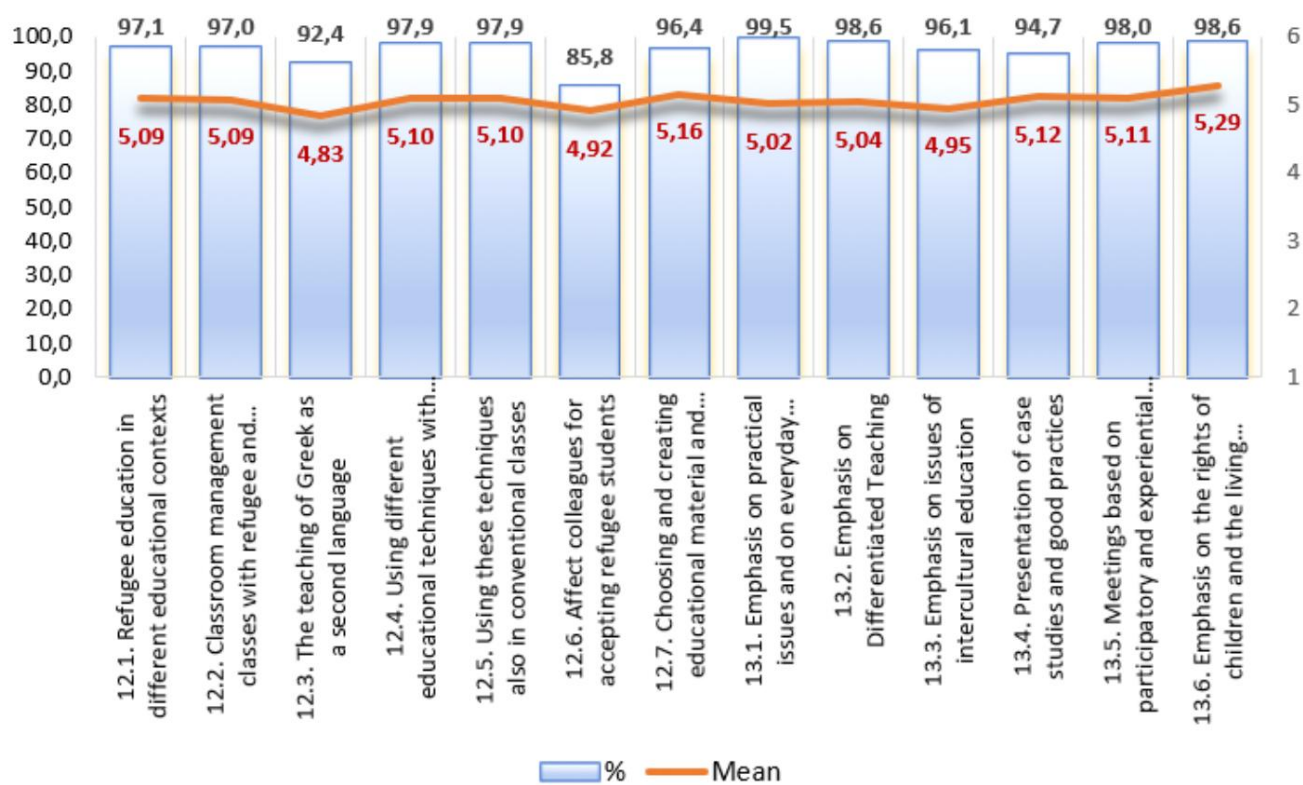
Table 3. Platform evaluation
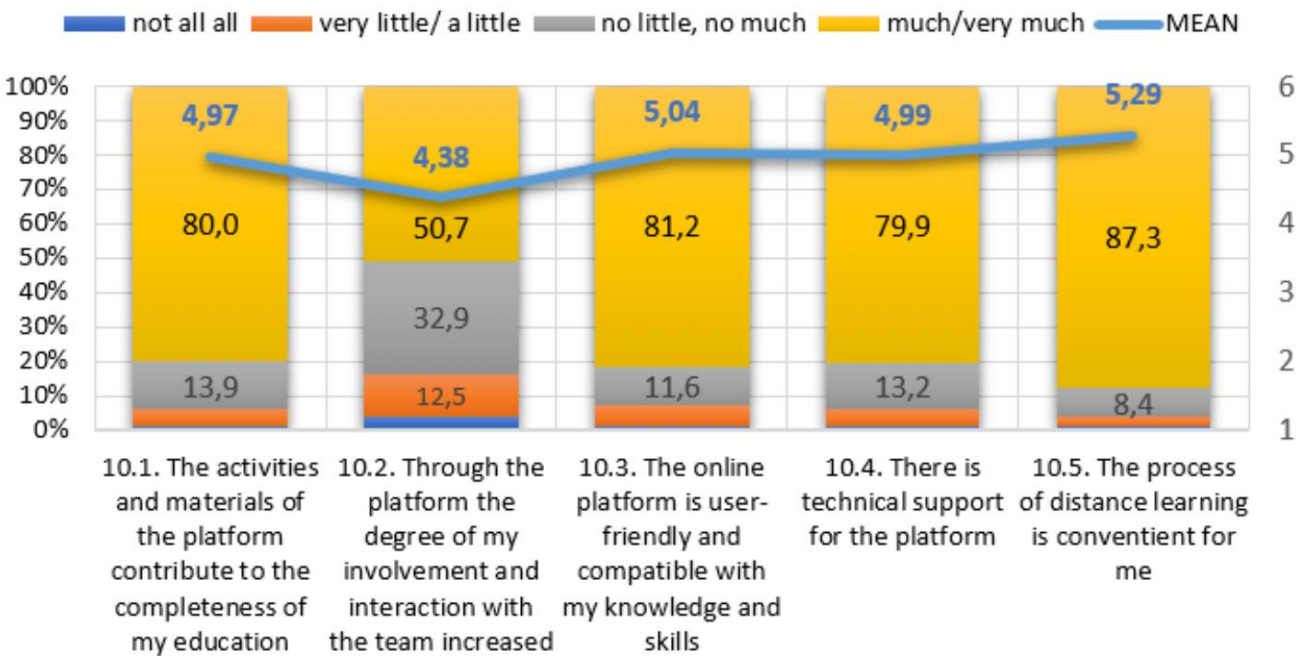
4.1 Addressing the theory-practice gap

With regards to the theory-practice gap, it was specifically addressed through axes 9.6 (Table 1.b), 13.1 and 13.5 (Table 3). Specifically, participants reached significant consensus (85%) that there is a sufficient link between the contents of the program and their actual needs and experiences. They agreed to a greater

degree (99,5) that the program placed emphasis on practical issues and on everyday educational practices. They also seem to have appreciated (98%) the fact that meetings were based on participatory and experiential approaches.

Findings from focus group discussions mostly align to the above general view. The emphasis on practical issues (lesson design, classroom implementation) seems to have been deeply appreciated, as shown in the excerpts below:

Excerpt 1:

"*The first time I tried my lesson plan, I didn't have a classroom of my own [being an assistant teacher to a refugee reception class], so I collaborated with a colleague from my school who was the teacher of the class, and who didn't participate in the program. I had never experienced actual collaboration with colleagues before, this was a really good experience for me*".

However, complaints were also expressed as to the degree of organizational turbulence created by classroom implementation:

Excerpt 2:

"*There was very little time to organize and implement two lessons. I really wanted to do both, but I finally only managed the first assignment*".

The experiential character of activities in meetings was also commonly appreciated. There were however other aspects, such as specific materials in the platform, that were highlighted as contributing to actually connecting theory with educational reality:

Excerpt 3:

"*I felt really touched by the video of unit 4. I discussed it with friends and colleagues and it made a great impression on me*".

Discussion and sharing also has contributed:

Excerpt 4:

"*I liked that I had the chance to listen to the issues colleagues face in primary education. I' m a secondary education teacher and this was really enlightening for me*".

4.2   Perception of community

With regards to their perception of community, it was specifically addressed through axes 9.2, 9.4 and 9.5 (Table 1.b) and 10.2 (Table 3). Specifically, participants agreed, to a 91,2% that they received encouragement and support from their trainers. They felt, to a 87,5% comfortable to express their opinions, questions and experiences. The contribution of the platform features to building community hasn't been that positively evaluated though, as only 50,7% of participants agreed that it helped increase their degree of involvement and interaction. The message is clear that the platform constitutes a relatively weak aspect of the program and improvement is needed for the next rounds of its implementation foreseen in 2022-23 and 2023-24.

Excerpts from focus group discussions shed more light in the above axes. As regards the roles within the community (peers/colleagues, trainers and tutors):

a) Interaction with peers/colleagues

The relationship with peers/colleagues varied significantly across the 7 groups represented by the 15 focus group participants, shaping a continuum from little interaction, to a vivid and lively collegial relationship. Excerpts 5 and 6 are indicative of the two ends:

Excerpt 5:

"*I struggled to connect with my colleagues. First, I thought this was due to the two first meetings being held online. When we met in person, however, still […] I could not connect. I don't think it was our tutor's fault, as she tried everything she could to make us discuss and collaborate. I think it has to do with the specific group. There was too much talk on what goes wrong in our schools and little on what we can do about it. Three or four people dominated the discussion, both online and face-to-face. I couldn't connect*".

Excerpt 6:

"*I feel lucky. I was in an incredible team. We established rapport very early in the program, though we didn't know each other, coming from the same district, but from different schools and areas. Almost half of us [there were 28 people in the group] chose to collaborate on assignments, we had our own group on viber and we are still in contact*".

b) Interaction with tutors

Interaction with tutors seems to have been vital to trainees. Several participants agreed that their role was the most important in T4I3, specifically referring to aspects of their role such as providing feedback, organizing meetings and answering questions and addressing issues on a timely manner. Only one participant -representing one of the groups- reported that "*I appreciated the time and effort our tutor spent with us. But I think she was either too young or too inexperienced to deal with us. It is a fact that some colleagues were negative towards her from the beginning, and this affected all of us*".

c) Interaction with trainers

Interaction with trainers has also been positively perceived by participants. One of them highlighted their "more traditional role", as shown in the excerpt 7 below:

Excerpt 7:

"*Trainers were highly qualified people, most of them being university professors. We needed this authority, their knowledge and expertise. […] We teachers like to have such figures as trainers*".

Another teacher positively commented on trainers' various backgrounds:

Excerpt 8:

"*I liked that they [the trainers] came from very different places of the country and different universities. We had the chance to see a lot of people, experts in their field, in a small period of time*".

In relation to the features of the platform allowing for interaction, such as discussion forums, participants didn't mention them, either negatively or positively. Instead, they referred to other features (indicatively, the weekly organization of content or the need for a progress bar to follow their obligations) and made specific suggestions for functional improvements.

5. The tutors' perspective

In the focus group conducted with 8 tutors, the Principal Investigator of the project being the facilitator, the motivation of the trainees emerged as a key factor for the efficiency of the programme. Autonomous motivation is perceived by the tutors as crucial for the well-being of the trainees, and systematically leads to the adoption of transformative practices in trainees' school context (cf. Gorozidis & Papaioannou, 2014). On the other hand, controlled motivation seems to limit the active involvement of trainees, and does not bridge the theory-practice gap. In fact, due to an ethos of more theoretical and less practical trainings in Greece (Androulakis, 2021), in-service trainees are, in tutors' perspective, reluctant to engage in practical tasks, applied to their actual classrooms.

Sustainability of the training is also important, and gets a threefold dimension: i) transfer of the skills acquired in the training to innovation in teaching practices; ii) possibility of continued resourcing fron the programme after the end of its lifetime (availability of the LMS platform and free access to it for the trainees, possitibility of contact with the tutors on a voluntary but regular basis); iii) suggestions for correlating the project's outcomes with the United Nations' sustainable development goals.

Distance training has to be combined, in the tutors' view, with more flexibility and the offer of a modular, customised training path through available modules. As a tutor puts it (Excerpt 9),

Excerpt 9:

"*more flexibility has a real value for adults who are teachers, and who are teachers of refugees or other vulnerable groups. But it also has a symbolic value, as it showcases the good example: it shows how the training can be adapted to the needs of the trainees, just like the inclusive school has to be adapted to the needs of its students*".

The tutors are convinced that the COVID-19 pandemic changed radically and definitely the educational landscapes, including the ones with refugee and migrant students. Distance and online teaching and learning are considered as "the new normality". The challenge is how to reduce the inequalities among students, an how to render learning more interactive and socially sensitive.

Responsiveness of the programme to the trainees' needs is a matter of consciousness and of experience of the tutors, but also of techniques and practices known, shared and applied. The building of a community of practice goes through the creation of an online space, where trainees can gather and feel at ease, while performing specific tasks. The presence of tutors may be optional but scheduled, a space for technical support questions should be available, but most of all this online space must function as a place for trainees to gather, exchange and hangout (more than social media groups, e.g. Facebook-Meta, usually do).

6. Conclusions

This paper offers a first view on two challenging issues in online teacher training environments: cultivating and maintaining a link between theory and actual educational practice, and building a sense of belonging to a broader community.

Our findings indicate that we have addressed the theory-practice gap to a satisfactory degree during the first year of T4I3 implementation. More focused measures should be predicted to ensure a smaller degree of turbulence for school units and for teachers themselves, as actual classroom practice has proven challenging to participants in terms of time and effort. Distance and online education is seen as the new emerging normality.

On the other hand, building a community that would bridge the formal with the informal is something more complicated. Though questionnaire evaluation shows a positive attitude of participants towards community, we had little reference in focus group discussions on actual instances where teachers felt as community members. Forum discussions still remain an issue as to their contribution to honest, open and participatory professional dialogue, often being just "parallel monologues". Experiential activities seem to have worked well in face-to-face settings, but that was rarely the case in synchronous, online meetings.

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Open education for refugees: the Greek reality and the challenge for the Hellenic Open University

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Introduction

Greece has been at the epicenter of the refugee crisis which evolved during the last year. Due to its geographical position it has been the entry point and host state for thousands of refugees and asylum seekers. After the first critical period of the crisis, which pertained to the establishment of a secure and safe environment for them, issues of social inclusion arose. Although state efforts to guarantee children's uninterrupted school attendance were prompt, there was not the same response as far as adult education is concerned.

Greece belatedly created a primitive educational scheme for adult refugees and asylum seekers, which focuses mostly on their voluntary participation in Greek language classes. Teaching takes place exclusively within the premises of host camps. From this angle, adult refugees have limited access to education. This condition has triggered the Hellenic Open University (HOU) to create a two-year post-graduate program addressed at potential language educators of refugees. This program has attracted attention from a wide range of practitioners, involved with refugee studies. However, open education for refugees is not yet an attainable target. Research shows the immense positive effect of open education to refugees, since it allows for the inclusiveness of vulnerable groups; it is tallied to the needs of every student, while it offers credentials for cultural respect. Nevertheless, there is no such planning so far.

This research paper aims at demonstrating how the HOU could serve as an educational hub for refugees and asylum seekers. It shows how refugees may well participate in particular programs offered by the university. It will then emphasize on issues of equity-based pedagogical practices (a), educators' skills to engage in their teaching plan refugees (b), and policies regarding intercultural respect (c). Finally, it will argue that HOU is the most preferable institution regarding adult education for refugees, also pointing out at the long-term positive effects on their social integration.

Refugees and education

The right to education is a well-established right, enshrined in international instruments, as well as in national legally binding documents. The right to education bears a series of facets, including untrammeled access to education for everyone, irrespective of any other factor or parameter. More specifically, access to education and participation in educational schemes cannot be dependent on a person's race, religion, gender et.c. or any other factor which would render the educational process a discriminatory one (Nowak, 1991). From this perspective, refugees and asylum seekers cannot be precluded from their right to receive proper education (Hodgson, 1996).

This proposition seems self-evident, since it repeats the major principle that people in distress shall enjoy their rights too (Magos & Margaroni, 2018). Yet, this is far from reality for a series of reasons. First, the proposal that refugees and asylum seekers shall enjoy and exercise their right to education stumbles at those groups characterization. Although, refugees, asylum seekers, or economic migrants all share

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in common that they find themselves in the territory and jurisdiction other than the one of their origin, there is significant differentiation in their legal treatment. Refugees enjoy privileges attributed to them by international conventions, whilst asylum seekers and economic migrants' rights are usually not well respected. This dichotomy in human rights' enjoyment stems from two reasons: it is owed to constantly increasing migratory flows which are inversely proportional to host states' financial resources (a). Host states, are unable to accept such large population groups and guarantee a minimum threshold of their rights protection, even if they were politically willing to. What is more, host states adopt unfavorable policies to the arrival of economic migrants, to secure their supposed national security, and the well-being of their own nationals (b). As a result, it is only refugee rights which are well-respected, according to international provisions and responsibilities. This research uses these three terms (refugees, asylum seekers, economic migrants) interchangeably, so as to foster the argument that all three share the common feature of people in distress for being in a foreign country cut off protective institutions (Grandrath, 1996). They are all considered vulnerable, either due to fear if they return to their homeland, or due to financial hardship which perils their very subsistence. Thereat, although their vulnerability emanates from different reasons, they are all in such a position which demands for enhanced protection.

The second reason why their right to education is not well respected relates to the right itself. The right to education has received wide international recognition, as it is stipulated in instruments of a global ambit. It is categorized though, as a social right, of a collective character, whose structure and features completely depend on states' discretionary authority. In this context, there are variations on a national level with regards to primary, secondary and higher education, its recipients and the educational program (Anselme & Hands, 2010). These variations exist even in the European plane, despite common denominators and standards (Coomans, 2004). Greece, for example, provides for mandatory primary education and three years of secondary education. In contrast, higher education is optional. In addition, the state's constitution provides that nationals shall be the right's recipients, or conversely that the state bears responsibility to offer education to Greek only. Consequently, there is a twofold barrier regarding the provision of higher education of refugees: higher education is optional according to national legislation, but even if it were compulsory that state is due only vis-à-vis its nationals.

As a matter of fact, university education for refugees is not a priority. Education is considered a luxury, given that people entering the soil of another country need to first settle and take care of their documentation and personal affairs. This process is timely, and hinders incorporation in the national educational systems. Further, the right is well-founded in international law, yet in abstract terms; when states tailor the right's aspects to their national legal order, specifications narrow significantly its scope of application in terms of content and end-recipients. Although this is an ordinary and legitimate adaptation, when it comes to a right's incorporation on a national level, there shall be particular warranties to avert its discriminatory application.

Refugees and the politics of education
Apart from structural deficiencies that states need to overcome to allow refugees enjoy their human right to education, refugee education is also the outcome of clashing political approaches. The politics of refugee education are a tiny aspect of refugee politics. More specifically, states which receive large refugee flows attempt to

better shield their borders and decrease the flow volume. This is primarily due to economic reasons, as well as the outcome of internal politics. European host countries employ strict legal regimes with regards to refugee flows, disregarding these people's distress and vulnerability. Although it is claimed by large majority of theory, that refugees are seen as intruders, posing threat to states' domestic consistency and integrity, this is not the case of this research. A more mediocre view would opt to reconcile refugees' need to find a safe and solid environment to settle, with states' anxiety to cope with increasing flows, which exceed the confines of a simple crisis (Tzoraki, 2019).

In this framework, the following paradox comes: host states have prepared for large influxes which they certainly would like to avoid, and at the same time they are aware of refugee long stay in their land due to bureaucracy and documentation proof.

National refugee facilities are now well organized compared to the beginning of the crisis and there are safe predictions and estimations on how long refugees will have to settle therein. From this standpoint, these requirements have now been taken care of and the possibility for refugee education is viable. As a matter of fact, refugee education comes now as a point of political choice. States' choice on how much they are willing to open the doors of education to them, given that their human needs, including issues of subsistence and dignity are better taken care of. From this angle, political choice pertains to refugee societal inclusion (Zhen, 2016). Their societal inclusion is a far more complex issue, connected with a state's public opinion, how they perceive cohabitation with refugees and if they are willing to accept them in the long-term as a constituent of their society.

Negative connotation over refugee incorporation in society has long been studied both from a policy viewpoint, as well as from anthropological perspective. However, there has been an attempt to open primary education to refugees. Greece has belatedly decided to open primary education to refugees, particularly to children and females (Acosta, 2016). This initiative has been fostered by international organizations and agencies which realized the magnitude of the problem and how a potential educational gap would endanger social inclusion and stability (Sarikoudi & Apostolidou, 2020). International organs have not been intuitive rather they managed to look in depth at the long-term effects of leaving refugees out of the educational process. Of course, recipients of such initiatives cover a very small percentage of refugees. Such actions concern only refugees and they are certainly not directed to economic migrants, whose legality is doubted in many national legal orders. Moreover, the beneficiaries of these programs are usually refugees who have an educational background and are in a position to value their significance even during a period of distress.

Finally, the politics of refugee education relate to another important debate which has arisen: whether primary education is preferred over university education. First, educational programs ran at the time being by the UN aim at language learning and children's inclusion in society, so as to build healthy personalities and avoid psychological problems in the future, a try not to have "futureless" children (Brun, & Shuayb, 2020). In Greece, this programme is of utmost important given the state's uniqueness, taking into consideration that the Greek language is considered fairly difficult and it is rarely spoken outside the state's frontiers. Furthermore, such programmes also have a social goal not to leave women behind, as part of the existing gender gap and the sustainability goals. So far, it is proven that in refugee camps women tend to stay inside for almost all time to take care of the household, while males take care of the family's documentation and are able to get in touch with national authorities, and socialize in multiple ways. From this point of view, their

entry in primary education is considered a means of socialization, and simultaneously an activity which will allow them to assist their children in their new educational environment. As such, preference of primary education over higher education seems a necessary compromise and the best starting point. Yet, this is not the only solution (Dryden-Peterson, 2010).

There are voices which raise concerns and mention that higher education can also be taught in English and so the linguistic barrier is immediately diminished (Bajwa *et al.*, 2017). In Greece there are already undergraduate and postgraduate programmes entirely in English. Apart from the linguistic parameter there are at least another two factors which shape the current debate. The first inquiry relates to the educational level of refugees, and whether they are in a position to receive higher education. The conflict in Syria has utterly changed the scenery as far as refugee educational level is concerned, since adults are in their majority university graduates with significant studies (Smith, 2018). Of course, there are always exceptions, like the Yazidi community where levels of illiteracy are high. In this regard, there are candidates among refugees able to thrive in higher education. The second issue of concern is if by restricting refugees' educational choices, reducing them to primary education, one convicts them to land labor and rural work. Such an approach brings forth questions of refugees' potential class separation. Although European and other host states do not adopt such a policy and they openly denounce it, this allegation is not far from reality, underlying a potential danger of refugee communities turning to ghettos.

The saga on refugee higher education becomes even more complex, given its multifactorial character. Refugee education, and their treatment in general, involves international actors (organizations and specialized agencies) which place particular preconditions and minimum thresholds, non-governmental organizations which have assumed on-field responsibilities and refugee support, as well as national authorities implementing state policy. From this spectrum, the mosaic covering refugee education is multifaceted from the very beginning. In the case of Greece, complexity increases due to the state's membership at the European Union and its regulatory system.

The involvement of these actors creates bewilderments in terms of the applicable legislation and it is also time-consuming.

Refugees and the opportunity for open education

Looking at the big picture, host states carry already a significant burden as far as refugee flows are concerned and the latter's education does not seem a first class priority. Apart from political hesitance and the absence of clear and definite state policies, the involvement of various aspects and the different educational background of refugees render their inclusion in higher education a difficult equation.

Open education is beneficial at this case for several reasons. First, open education is by definition all-inclusive. Students enter open universities irrespective of demographics and educational background. The important feature when they choose to enter open university programs is the challenge to achieve their goals and get a second chance with education (Bliss, Brooks & Huq, 2021). Open universities are in a position to offer to refugees a suitable curriculum which they would be able to follow, since they have the ability to self-organize their time and effort and study with the guidance of their instructors. Moreover, open education which is conducted electronically almost entirely does not require refugee physical presence and avails the barrier of transportation in case they are not settled (Crea & Sparnon, 2017).

Another positive aspect of open education as far as refugees are concerned is that they have the time to shape their digital identity and reintroduce themselves to their

classmates and instructors. They may overcome any societal barrier and smoothly integrate with the rest students. In this regard, it offers a significant alternative for their education: it is higher education, suitable for the difficulties refugees encounter (Dryden-Peterson & Giles, 2010).

The Greek reality and HOU: a challenge for refugee inclusion

The Greek reality is not that positive for refugees' right to education. Their educational options are limited and they receive very few compared to the curriculum followed by state nationals. Having observed the need for refugee education and following the current international trends, the Hellenic Open University has introduced not very long ago, a postgraduate programme for language educators of refugees. This programme is novel since it offers to educators critical knowledge on the needs of refugees, as well as it delves into the topic of teaching Greek as a second language (Androulakis & Kitsiou, 2017). The HOU seems to have realized the need to overcome linguistic barriers and deal with refugee flows, which exceed the limits of a single crisis (Kafritsa, Anagnou & Fragoulis, 2021).

Evidently, this program has been a breakthrough and the first one in Greece to deal with refugees, even by reflection (Vasilopoulos & Ioannidi, 2020). Educating the educators is a tremendous step forward, demonstrating the University's serious commitment in refugee education. It is expected to have long-lasting effects and an impact which will fall outside the University's ambit.

Conclusions

The challenge put forward at this very point is how the University will address the ever-increasing need for refugee higher education. On this level there are several questions which further need be answered on the curriculum orientation, its structure, as well as issues of inclusion, equity and multicultural respect (Foulidi, Papakitsos & Alexaki, 2020). The HOU has not previously engaged with vulnerable groups and people in distress and this will be an unprecedented challenge. Thus, there are still many issues to be resolved and questions to be answered if such an attempt is to become truth. Except for University educational willingness to organize curricula which will be available to refugees there is also the need for political choice and the coupling of the two. Such an initiative would involve series of national authorities, ministries and international agencies.

Although there is room for such a case, there is no previous experience in the Greek reality. Examples coming from other host countries, such as Lebanon (Buchner, Spencer & Cha, 2018) and Canada, and the treatment of refugee education by them, offers useful insights for interested actors.

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OER and Sharing Content

Creating a sustainable OER business model: Free + open?

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Abstract (Calibri, 12 pt, bold)

This paper reports on a mixed methods study, which explores the intersection between higher education and business in the area of Open Educational Practice and is part of the European Network for Catalysing Open Resources in Education (ENCORE+) project. The Encore project is an Erasmus+ funded initiative, which aims to raise awareness of open education, coordinate stakeholders and support new strategies for the proliferation of Open Education Resources (OER) (https://encoreproject.eu/).

Open education is a philosophy that believes that "everyone should have the freedom to use, customize, improve and redistribute educational resources without constraint" (Cape Town Open Education Declaration, 2012). Although Open Educational Practices (OEP) have existed for over thirty years in higher education research and practice, they have remained at the margins (Zawacki-Richter, et al., 2020). There are a number of reasons that OEP has not become mainstream in Europe:
1. A lack of sustainable business and financial models to support large-scale adoption and
2. An absence of systemic and strategic approaches at a European policy level (Farrell et al., 2021).

This research explores how the relationships between higher education and business can address these barriers to mainstream adoption and catalyse larger scale adoption of OEP through the ideation and development of innovative and sustainable models for Open Educational Practice. In order to support the mainstreaming of OEP, it is necessary to gain a greater understanding of how higher education institutions and business interests can work together to better leverage the potential of open education.

The study adopts a convergent parallel mixed methods design (Creswell, 2014) using qualitative and quantitative methods of inquiry. The study is framed by the following overarching research question: What is the relationship between business, higher education and open educational practice?

In this presentation, we will report on our emergent findings on OER value propositions, OER business models and sustainability approaches. Participants will be invited to give feedback on our recent report: *Strategic Support for OER Value proposition* and to get involved in the Encore community.

Keywords: Open Education, OER

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Determinants of Greek students' intention to use Facebook for academic purposes

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Abstract

Even though Facebook is now one of the most popular social media sites for college students, its affordances are rarely utilized for educational purposes. Limited studies have been conducted about the usage of Facebook and most of them mainly explore the acceptance of the academic usage of Facebook by students, using the technology acceptance model (TAM), without using multivariate analysis. Moreover, previous studies have scarcely investigated factors such as trustworthiness and perceived enjoyment. Data were collected from 128 Greek students from the department of Early Childhood Education at the University of Athens. The study applied the TAM to examine the factors that affect students' behavioral intention to use Facebook for academic purposes. Particularly, it investigated the influence of four external variables on the original factors of the TAM for a better understanding of students' intentions to utilize Facebook in their studies: a) Perceived self-efficacy, b) Social influence, c) Trustworthiness, and d) Perceived Enjoyment of Facebook. All constructs showed a high level of internal consistency reliability and satisfactory discriminant validity. Partial Least Squares and SEM (PLS-SEM) application indicated all these external factors affect the Greek students' intention to use Facebook for academic purposes. The analysis supported that this TAM version is an excellent adaptation to the factors which determine the students' behavioral intention to use Facebook and explained 60% of the total variance of the specific intention. The constructs of Perceived Use, Attitudes, Trustworthiness and Perceived Enjoyment have a direct effect on Behavioral Intention, while Perceived Ease of Use, Perceived Self-Efficacy, and Social Influence, affect Behavioral Intention indirectly. Implications and limitations are discussed.

Keywords: Higher education, Technology acceptance model, Trustworthiness, Perceived Enjoyment.

1. Introduction

Social networks are utilized more and more in our daily lives and consider very popular mainly among young people (Athanassopoulos et al., 2021). Particularly, students consider Facebook as a very important medium that helps them adapt to their academic life in a faster and more enjoyable way (Athanassopoulos et al., 2021; Cheung et al., 2011). Students use Facebook in their studies for academic purposes such as, to exchange information on various topics, related to the university itself, lectures, studies, academic activities, and their daily life (Athanassopoulos et al., 2021; Manesis & Papavenetiou, 2019).
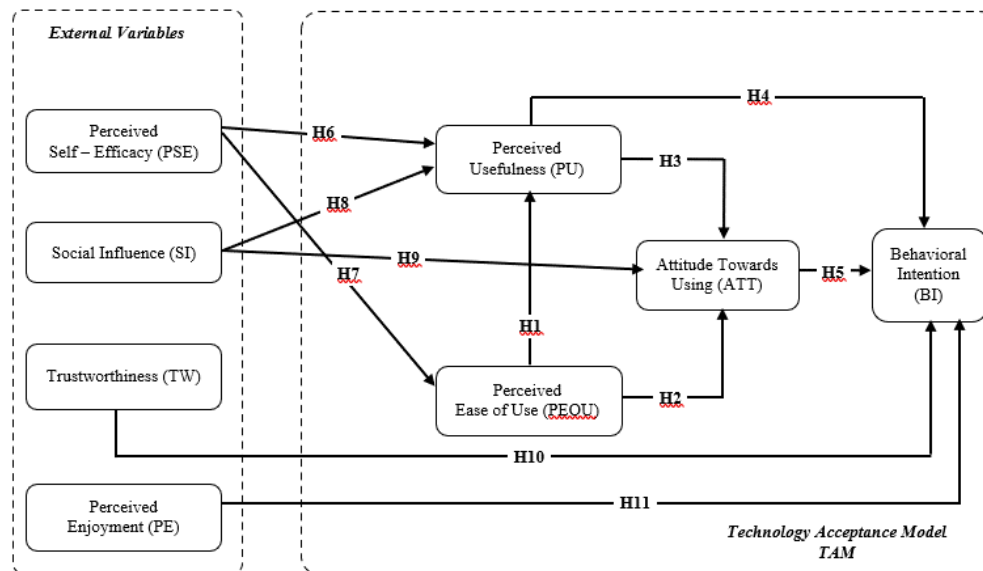
Regarding the students' intention to use Facebook for academic purposes limited studies have been conducted worldwide using the technology acceptance model (TAM) (Davis et al., 1989). Some of the previous studies include specific external factors such as social influence and perceived self-efficacy (Mazman & Usluel 2010; Sanchez et al., 2014; Wadie & Lanouar, 2012). Other studies in a low degree include factors such as trustworthiness and perceived enjoyment (Rauniar et al., 2014; Tiruwa et al., 2018). In Greece, few studies have been conducted about the usage of Facebook mainly exploring the acceptance of the academic usage of Facebook by students, using the technology acceptance model (TAM) (e.g. Manesis & Papavenetiou, 2019) without to use of multivariate analysis. Moreover, the previous studies have scarcely investigated factors such as trustworthiness and perceived enjoyment (Rauniar et al., 2014; Sharma et al., 2016; Tiruwa, et al., 2018). Therefore, this paper comes to fill this gap as well as provide insights into the factors that explain the Greek students' intention to use Facebook for academic purposes.

2. Conceptual model of students' behavioral intention to use Facebook for academic purposes

Figure 1 is shown the conceptual model that was investigated in this study, which is a visual representation of constructs of interest and how they connect. Analytically, all these constructs and the hypotheses (direct arrows) are discussed following. The technology acceptance model (TAM) was designed by Davis and his colleagues (Davis et al., 1989) to explain and predict the likelihood of new and innovative technologies being adopted by individuals. TAM is adopted in this study to reveal students' perceptions of Facebook usage for educational purposes. It includes perceived ease of use (PEOU), and perceived usefulness (PU) as the major factors that influence users' behavioral intention (BI) to use innovative technology. PEOU has a direct impact on PU regarding technology (Lavidas et al., 2019; Parissi et al., 2019). Both PEOU and PU influence the users' attitude (ATT) toward using a technology (Lavidas et al., 2019). PU and ATT have a direct impact on BI (Lavidas et al., 2019;). Perceived self-efficacy (PSE) refers to one's belief in one's ability to succeed in specific situations under specific circumstances (Bandura, 2010; Lavidas et al., 2019). The term PSE in this study concerns users' beliefs in their abilities regarding the academic use of Facebook. PSE could affect students' technology adoption of Facebook for educational purposes and learning management systems (Lavidas et al., 2022). Hence, PSE has a direct impact on PU and PEOU, and therefore indirectly affects the BI to use Facebook in education. Social influence (SI) regards the degree to which a student considers that the people who are important to him/her, such as friends and peers, think that he/she should use a new system (Venkatesh et al., 2003). The term SI in this study is defined as the extent to which the students' perceived expectations from relevant others to use Facebook in their studies. Students are influenced by the opinion of their peers regarding their usage behavior. Therefore, SI has a direct impact on PU and ATT (Lavidas et al., 2019). Trustworthiness (TW) is defined as the degree to which an individual believes that the exchange of information and data which finds on Facebook, regarding his/her studies, is relevant, objective, and reliable (Rauniar et al., 2013). TW should be the main factor in TAM for the educational use of Facebook since students must feel secure with their profile data, shared documents, and icons, to use Facebook for their studies-related activities (Rauniar et al., 2013). Hence, TW has a direct impact on BI. Perceived enjoyment (PE) refers to the feelings of delight and

pleasure a user has when using social network sites (Sledgianowski & Kulviwat, 2009). In social media, PE is considered a determinant of BI to use (Dumpit & Fernandez, 2017; Sledgianowski & Kulviwat, 2009). Moreover, social networking site users need to consider the structure of a specific site and an enjoyable experience to create and share educational material (Dumpit & Fernandez, 2017). Therefore, PE has a direct impact on BI.

Figure 1. The conceptual model

Note: H1 to H11 are hypotheses regarding the direct effect among the constructs

3. Research objectives

This research aims to examine the factors that affect Greek students' behavioral intention to use Facebook for educational purposes. Particularly, we investigate the influence of four external variables on the original factors of the TAM for a more detailed comprehension of students' behavioral intention to use Facebook for academic purposes. The four external factors are a)Perceived self-efficacy, b)Social influence, c)Trustworthiness, and d)Perceived Enjoyment of Facebook.

4. Methodology

4.1 Research procedure and sample

In this research, we follow a cross-sectional quantitative research method. The research was carried out in November 2019 with a convenient sample of 128 (127 females and 1 male) preschool University students from the National and Kapodistrian University of Athens. The distribution of participants' Age is, up to 19 (39.8%), 20-21 (46.1%), 22-23 (5.5%), 24-25 (2.3%), at least 26 (6.3%). The Google form was used to collect the students' responses, following the guidelines of Lavidas and Petropoulou et al. (2022), to increase the response rate Lavidas et al. (2022) found that participants were more likely to complete a survey if the survey should not take more than 10 min to complete. The participation in the study lasted approximately 8 minutes.

4.2 Research instrument

The questionnaire consisted of two parts; in the first part, we gathered demographic information about the students, such as gender and age. The second part of the questionnaire consisted of 25 statements (Table 1) adapted from previous work. Specifically, we utilized items for BI and ATT from Lavidas et al., (2022), items for

PU, PEOU, and SI from Sánchez et al., (2014), Items for PSE from Manesis & Papavenetiou, (2019), items for TW from Rauniar et al., (2014), and items for PE from Sharma et al., (2016).

4.3 Data analysis strategy

Partial Least Squares – SEM (PLS-SEM) is used in the R environment and the "plspm" package (Sanchez, 2013). The measurement model was examined first, and the structural model was tested afterward. Regarding the structural model, the direct path coefficients among constructs were tested.

5. Results

Table 1 shows the reliability and convergent validity indexes of the measurement model. For all constructs, Cronbach's Alpha, as well as Composite Reliability, exceed 0.7, so these constructs present a high level of internal consistency reliability (Raykov, 1997). Additionally, all the statements were loaded with significant values greater than 0.7 without cross-loadings as well as the variance that is explained by each construct (AVE) over 0.5 indicates a satisfactory convergent validity (Sanchez, 2013). Moreover, the Fornell-Larker criterion (1981) indicated satisfactory discriminant validity since the square root of each construct's AVE exceeds all correlations among constructs. The maximum correlation among constructs is 0.7.

Table 1. Descriptive statistics, and reliability and convergent validity indexes of the measurement model

	Mean (SD)	λ	a	CR	AVE
Behavioral Intention (BI)	**3.50**		.927	.954	.872
B1. I intend to use Facebook for educational purposes	**(.98)**	.929			
B2.I intend to use Facebook for educational purposes as often as possible.		.943			
B3. I intend to use Facebook for educational purposes in the future		.930			
Attitude Towards Using (ATT)	**3.16**		.881	.927	.807
ATT1. I like to use Facebook for educational purposes	**(.93)**	.880			
ATT2. I think it is worthwhile to use Facebook for educational purposes		.922			
ATT3. In my opinion, it is very desirable to use Facebook for educational purposes		.894			
Perceived Usefulness (PU)	**3.23**		.880	.926	.806
PU1. Facebook allows me to communicate with my colleagues in a short time period	**(.99)**	.906			
PU2. Facebook makes it easier to establish and maintain personal relationships		.907			
PU3. Facebook allows me to share more in a short time period.		.880			
Perceived Ease of Use (PEOU)	**3.47**		.803	.884	.717
PEOU1. I became a Facebook member with ease	**(.95)**	.868			
PEOU2. My interaction with Facebook is clear and understandable		.812			
PEOU3. I do not have any problems learning about Facebook features on my own		.859			
Perceived Self–Efficacy (PSE)	**3.52**		.822	.883	.655

PSE1. I am good at using Facebook	**(.88)**	.856			
PSE2. I am confident that I can learn to use Facebook		.848			
PSE3. I am quick to learn about social media		.823			
PSE4. I can cope with the difficulties encountered in the use of Facebook		.701			
Social Influence (SI)	3.14		.795	.880	.709
SI1. I use Facebook because my friends recommended that I do	**(.88)**	.877			
S2. I pay more attention to the Facebook features used by my friends/contacts		.856			
S3. I use Facebook because many people I know expect me to use it		.792			
Trustworthiness (TW)	2.75		.858	.914	.779
TW1. I trust Facebook for the information on my profile	**(.86)**	.861			
TW2. Facebook provides security for my postings		.901			
TW3. Facebook provides security for my profile		.885			
Perceived Enjoyment (PE)	3.62		.907	.942	.843
PE1. I enjoy Facebook because it entertains me.	**(.97)**	.906			
PE2. I enjoy Facebook because it gives me the freedom to express my feelings.		.909			
PE3. I enjoy Facebook because it reduces my stress.		.939			

Note: λ=Factor loadings, a=Cronbach's Alpha, CR=Composite reliability, AVE=average variance extracted

Table 2 shows the path coefficients among constructs and their estimation by robust 95%-confidence intervals (Sanchez, 2013). Considering the confidence intervals, 9 out of 11 hypotheses that are presented in the conceptual model (Figure 1) were supported. Moreover, as a footnote in the table, you can see the R^2 or the coefficient of determination, which is the explained variance for each endogenous variable in the model.

Table 2. Structural model: Path coefficients and 95% confidence intervals with bootstrapping (2000 samples)

	Path Coeff.	95% CI	Results
H4: PU -> BI	.234	.077 - .404	Supported
H5: ATT -> BI	.210	.047 -.392	Supported
H10: TW -> BI	.324	.181 - .462	Supported
H11: PE -> BI	.166	.005 - .316	Supported
H3: PU -> ATT	.466	.301 - .630	Supported
H2: PEOU -> ATT	.113	-.070 - .266	Not Supported
H9: SI -> ATT	.317	.189 - .457	Supported
H1: PEOU -> PU	.674	.535 - .798	Supported
H8: SI -> PU	.139	.002 - .280	Supported
H6: PSE -> PU	-.014	-.156 - .136	Not Supported
H7: PSE -> PEOU	.496	.335 - .646	Supported

Note: Explained variance for each endogenous variable in the model: R^2(BI)=60%, R^2(ATT)=54%,

R^2(PU)=53%, R^2(PEOU)=25%

6. Discussion of results

This work applied the TAM to examine the factors that affect Greek students' behavioral intention to use Facebook for educational purposes. Particularly, it investigated the influence of four external variables: a) Perceived self-efficacy, b) Social influence, c) Trustworthiness, and d) Perceived Enjoyment of Facebook. Results support that this TAM version is a good adaptation to the factors which determine the students' intention to use Facebook for academic purposes. The total explained variance of BI is high (60%). Moreover, the constructs PU, ATT, TW, and PE have a direct effect on BI, while PEOU, PSE, and SI, affect BI indirectly.

The factor PSE presented a statistically significant direct effect (.496) on PEOU and an indirect effect (.119) on BI. The higher a student's ability to succeed in specific situations, the higher the student perceives Facebook use to be easy to apply in his/her studies, and the higher their intention to use it. Regarding the factor SI, it was observed a statistically significant direct effect (.139) on PU, a direct effect on ATT (.317) as well as an indirect effect (.113) on BI. The higher a student's influence by others, the higher the student perceives Facebook as useful for studies, and the higher their attitudes towards Facebook usage and the higher their intention to use it. Moreover, the factor TW presents a statistically significant direct effect (.324) on BI. The higher students who believe that the exchange of information and data which find on Facebook is reliable the higher their intention to use it (Rauniar et al., 2014). Finally, the factor PE presents a statistically significant direct effect (.166) on BI. The higher students' feelings of delight and pleasure when using Facebook the higher their intention to use it (Dumpit & Fernandez, 2017; Praveena & Thomas, 2014; Sledgianowski & Kulviwat, 2009).

Regarding the above factors that explain the students' intention to use Facebook for academic purposes, stakeholders should support social media trustworthiness and perceived enjoyment to increase the usage for academic purposes. However, the fact that students were asked to present their perceptions is an issue that usually leads to response biases (Lavidas & Gialamas, 2019; Lavidas et al., 2022). Future research needs to focus on a larger sample of students from various universities and disciplines as well as the usage of other social media to verify the findings of the current study.

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Digital Open Educational Resources transform Higher Education: Unfolding Case Studies from the Hellenic Open University

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Abstract

Open Educational Resources (OER) focus on production, licensing, use and reuse of learning resources and their accessibility from open access editions as public goods. The increasing use of digital OER emerged from the spectacular impact of web-based learning environments by supporting increased interactions and providing feedback on learner's both understanding and performance. The effective use of OER triggers interactions and plays a critical role in the construction of knowledge, overcoming distance obstacles and providing a sustainable alternative to the traditional classroom.

Opening up education is not only about resources but also about the opening of teaching based on Open Educational Practices (OEP). OER contribute to shaping attractive learning environments and linking them to everyday life, thus offering rich learning experiences. OEP are based on modern pedagogical approaches of collaborative, personalized, discovery and active learning with emphasis on reuse and the creation of new content.

The paper unfolds three case studies performed at the Hellenic Open University (HOU), which highlight the potential of OER to transform teaching and learning in higher education.

In particular, the use and reuse of OER in designing and developing learning material oriented to distance education of the postgraduate courses ETA53 and ETA62 in 2021-2022 will be presented in the first case study.

The second case study presents the design and development of the Guide for Effective Teaching (GET) as a key pillar of the in-service professional development of the undergraduate course EPO12 academic staff at the HOU. The GET aimed to enrich the teaching material using OER, implement active educational techniques during the tutorials based on OER as "social objects" taking advantage of the collaborative learning and building a Professional Learning Network. The GET can be expanded to other distance learning environments and includes OEP planned to be adapted and reused by the academic community.

The third case study highlights the development of a MOOC aiming to raise awareness and support all Greek teachers of primary and secondary education about teaching in the framework of distance education. The course was the main pillar of their in-service professional development during the COVID19 pandemic and was developed in April 2020 in an emergent mode using fully and exclusively OER.

The aforementioned case studies in HOU show that the OER have the potential to support both teaching and training pillars in undergraduate and postgraduate courses and the professional development of the teaching/academic staff purposefully with concrete methodologies. All methodologies included can be adapted and expanded, providing guidance and orientation for institutions that would wish to develop their own strategy.

The transformative potential of OER following new learning methods opens up new educational models beyond traditional forms and limitations. OER increase the accessibility

and quality of higher education reducing the costs and bringing studies closer to millions of students. The creatively disruptive role of OER presents the strategic opportunity to facilitate the conversation regarding educational policies and includes the benefits of sharing and collaborating among higher education departments facing the challenges towards the vision of open higher education.

Keywords: open educational resources, distance education, higher education, Hellenic Open University, educational material

1. Introduction

Open Universities offer opportunities for studies and qualification to adult students using the methodology of distance education (DE). The Hellenic Open University (HOU) aims to fill the gap in open higher education in Greece offering exclusively DE, an alternative way of organizing studies and new methods for teaching using synchronous and asynchronous e-learning environments and a few optional face-to-face meetings too. The HOU was a pioneer in the late '90 building a brand name for adults. In a fast-changing world, HOU faces challenges like (Papadimitriou, Ioakeimidou, Lionarakis, 2019):

- Quality education for all
- Providing its expertise to other traditional universities
- New and preparatory programs
- Accreditation of non-formal or informal knowledge

OER have the potential to meet these increasing challenges. The effective use of OER triggers interactions and plays a critical role in the construction of knowledge, overcoming distance obstacles and providing a sustainable alternative to the traditional classroom.

The article aims at highlighting the potential of OER to transform higher education through three specific case studies realized in the HOU. The first unit defines the concept of OER, their classification in digital repositories and illustrates ways of teaching based on OER. The next units unfold three case studies in HOU and the article is completed with key outcomes and discussion about the impact of OER on increasing the accessibility and quality of higher education studies.

Table 1: Case studies' short descriptions

Case study	Target-group	Framework	Number	Scope	Action	Years of implementation
First case study	Students	Post graduate courses of HOU: ETA53 & ETA62	1.200 students each academic year	Official development of educational material by the HOU	Teaching and Learning	2020-2022
Second case study	Tutor-Counselors	Post graduate course of	15 Tutor-Counselors each	Action research in Ph.D thesis	Professional development	2013-2014

		HOU: EPO12	academic year			
Third case study	Teachers of Primary and Secondary Education In Greece	MOOC	180.000 Nationwide	Official development of educational material by the HOU and IEP – Ministry of Education	Professional development	2020

2. Teaching and learning with OER

2.1 Repositories of OER

The UNESCO Paris OER Declaration (2012) defines "Open Educational Resources" (OER) as:

"Teaching, learning and research materials in any medium, digital or otherwise, that reside in the public domain or have been released under an open license that permits no-cost access, use, adaptation and redistribution by others with no or limited restrictions."

OER are gathered and stored in databases called Repositories and they are developed by Universities, Institutes, institutions and professional bodies. In the repositories, OER are classified by topic, level, format so that they are easily searchable and accessible with various search criteria and are described by a set of metadata. OER are leveraged by users, who have the ability to adapt them to their teaching or learning practices and then offer them enriched to be reused by the educational community.

OER-Repositories can be considered as dynamic and organized records of the expertise of the educational community due to their continuous potential of enrichment and expansion. OER-Repositories support teachers to organize and run courses by leveraging existing resources and contributing new ones themselves, helping to expand them. The OER aimed at the organization of face-to-face, online or hybrid courses and cover a variety of pedagogical approaches.

Openly licensed educational materials have enormous potential to contribute to improving the quality and thus the effectiveness of education. The challenges of increasing access, combined with the continued spread of Information Communication Technology (ICT) infrastructure in higher education institutions, show that it is becoming increasingly important for them to support the improvement of curricula in a targeted way and the quality of educational material. OER provide a crucial flexibility to adapt resources from various educational contexts to other where needed. Flexibility is a key feature in open education and should be encouraged rather than restricted. So, OER construct on shared "intellectual capital", reducing unnecessary repetition of similar efforts and collaboration, which improves quality. The effective use of OER offers practical application and support to the main characteristics of open education: accessibility, flexibility, and student-centeredness.

2.2 Learning based on OER

OER consist an achievement of the digital age and they lead to the redesign of learning environments as well as teaching practices. New challenges are emerging in respect of teachers and students' roles. Their systematic information and awareness in matters of OER utilization is necessary in the context of the corresponding strategic planning of higher

education institutions. Issues and concerns that have arisen after more than a decade of OER's rise are:

- the design of new teaching practices for their effective use,
- the low support for informative and educational actions of teachers,
- the use of "copyrighted" material in so-called open courses,
- the ways to ensure the quality of the content,
- the viability and interoperability of Repositories,
- the search for new educational models towards the vision of an open global education.

Learning based on OER is an educational option, which forms strategies oriented to the active participation of students in constructive learning activities by using digital resources. It requires access to a vast "repository of knowledge" and offers opportunities for learners to approach group or individual learning. Collections, subject matters, and object type such as simulations, experiments, interactive applications, maps, microscope observations, and more classify OER-Repositories.

Moreover, teachers are the vital factors in ensuring quality in teaching and learning. Among the challenges they face (The Commonwealth of Learning, 2003), are:

- the time constraints from preparing curricula and selecting, developing and/or adapting teaching materials and assessment tools,
- access to high-quality teaching material,
- the need to address the often-diverse learning needs of students,
- the change from teacher-centered to student-centered approach,
- the increased access of students to educational material on the Internet, to collaborative networks and the opportunities of publishing on the Internet,
- the legal requirements resulting from widening access,
- the need to cover a wide and growing pool of knowledge,
- the need to regularly update knowledge and cultivate their ICT skills,
- the high expectations of students.

The effective use of OER can overcome many of the above challenges. They have the potential to develop the infrastructure to produce material providing institutions and faculties with access at low or no cost resources. Institutions and lecturers are responsible for selecting the digital or print educational material, open or not, which will form the main or additional study resources and lesson plans. For this reason, the quality of the learning environments depends a lot on the selection of the OER, the ways of adaptation relating to the existing ones and the ways of integration into learning activities.

OER based learning assumes that educators (both teachers and tutors) can advise guide and support students to engage in more open forms of teaching and learning. The use of OER implies a change in teaching practices, which at least requires:

- Access to organized OER-Repositories by various classifications.
- Knowledge of technologies and pedagogical methods of using digital content.
- Access to a network of experts and training centers to provide consulting and support services.
- Access to teacher networks aiming at exchanging ideas, experiences and resources, i.e., Professional Learning Networks (Trust, 2012).

3. Using OER at the postgraduate courses ETA53 and ETA62

3.1 Educational material in distance education

A brief review in the literature as well as in four PhD theses in the HOU (Manousou, 2008; Hartofylaka, 2012; Papadimitriou, 2014; Ioakeimidou, 2018) is sufficient to understand the importance and the complexity of the educational material in DE. This material presupposes special design and creation to serve DE needs since it consists the catalyst of students' learning.

The majority of open universities use distance learning material or "training package" (Rowntree, 1994), which is a "pre-fabricated and stored teaching" (Holmberg, 1995) regardless if it is printed or digital. This distance learning material is a dynamic tool, which defines the quality of the learning experience and its results (Hartofylaka, 2012).

Since its beginning, the HOU produced the vast majority of the educational material needed in modules following the principles of DE even though some modules use existing material borrowed from other open universities or books (Hartofylaka, 2012) developing appropriate guides to support them. The HOU formed teams to plan, write, edit, check and enhance the educational material. Each team is consisted of the module's coordinator, the writers, the critical reviewers, the expert on DE methodology, and the language editor (Hartofylaka, 2012). Furthermore, the Educational Content, Methodology and Technology Laboratory (e-CoMeT-Lab) operates as an independent unit in the HOU and supports HOU in applying educational, methodological and technological innovation in DE and educational content development. Based on the importance of the educational material in relation to the quality of the education provided, the *e-CoMeT-Lab* coordinates the process of developing digital educational content in compliance with international standards. In this context, the *e-CoMeT-Lab* has written pedagogical specifications according to the principles of DE as well as up-to-date scientific and technical specifications providing full technical support and training to developers.

In particular, the use and reuse of OER in designing and developing educational material oriented to DE of the postgraduate courses "*Educators and Students in open and DE environments: applications and support*" *(ETA53)* and "*Digital Media in Education and Communication" (ETA62)* in 2020-2022, will be presented in the first case study. Both courses are part of the postgraduate program "*Education and Technologies in Systems of distance teaching and learning*" *(ETA)* launched in 2020 by the HOU.

3.2 Using OER in ETA62 and ETA53

On the occasion of the courses ETA53 and ETA62, a team was assigned in 2020 to develop the learning material consisted of the coordinator of the postgraduate program ETA, three writers, one critical reviewer, and the language editor. The coordinator of the postgraduate program ETA and the two writers played the role of the expert on DE methodology themselves. All units produced were evaluated and adapted by the *e-CoMeT-Lab* to comply with the rules of the Moodle platform on the URL address: http://courses.eap.gr. A wealth of OER was being used from various Repositories presented on the following Tables 2 and 3 accordingly for both online courses ETA62 and ETA53.

Table 2: OER used in ETA62

Repository of OER	URL of the Repository	Number of OER
The Open Education / The Journal for Open and Distance Education and Educational Technology	https://ejournals.epublishing.ekt.gr/index.php/openjournal	1
The Kallipos Repository	https://repository.kallipos.gr/	3
Free legal and digital books	https://www.openbook.gr/	1
International Conference of Open and Distance Learning - Proceedings	https://eproceedings.epublishing.ekt.gr/index.php/openedu	5
Bates, Tony, Teaching in a Digital Age - Second Edition, chapters 8.5	https://pressbooks.bccampus.ca/teachinginadigitalagev2/front-matter/introduction/	2
Project:"Development of Accesible Digital Educational Material"	http://prosvasimo.iep.edu.gr/en/	5
Digital OER Aggregator	http://photodentro.edu.gr/ http://photodentro.edu.gr/oep http://photodentro.edu.gr/video	3

The proceedings of the ICODL have an Open Access Policy and provide immediate open access to its content on the principle that making research freely available to the public supports a greater global exchange of knowledge. A similar Open Access Policy characterizes the "Open Education / The Journal for Open and Distance Education and Educational Technology" which is being published twice a year by the "Hellenic Network of Open and Distance Education". Since 2009 (issue Num.7), the access to all publications is open to everyone through the webpage of the "Open Education" journal (Open Education, 2022).

The Project "Kallipos" is the first comprehensive effort to introduce electronic interactive, multimedia textbooks in higher education and a large-scale initiative for developing high quality open content. The Kallipos Repository contains more than 1200 high quality, digital textbooks for open use by everyone as students, teachers, researchers, lifelong learners, science lovers and will probably be the biggest repository of its kind in the world (Kallipos, 2022). Furthermore, the following resources have been proposed in ETA62 from relevant reliable and eminent European and international organisations:

- The European framework for the digital competence of educators "DigCompEdu" from the European Union publications (https://op.europa.eu/en/web/general-publications/publications).
- The digital competence framework for citizens "DigComp2.0" from the European Union publications.

- Three articles from Greek Conferences with open access proceedings (Hellenic Association of ICT in Education - www.etpe.eu, University of the Aegean, University of Ioannina).
- Two resources from the UNESCO learning material.
- Two resources from the JRC and JISC Institutes.
- Two resources from the HOU – MOOC "Teachers' training in Distance Education" presented in the third case study.
- One resource from the open book platform.

A vast number of OER have been delivered from the Greek web sites under public domain https://edutv.minedu.gov.gr/, https://i-create.minedu.gov.gr/, https://www.ekome.media/ enriching the material with videos, spots, podcasts and training resources. Infographics designed in https://www.canva.com/ by the writers enrich the digital learning material and furthermore consist new OER available for use, reuse or adaptation.

Table 3: OER used in ETA53

Repository of OER	URL of the Repository	Number of OER
The Open Education / The Journal for Open and Distance Education and Educational Technology	https://ejournals.epublishing.ekt.gr/index.php/openjournal	2
International Conference of Open and Distance Learning - Proceedings	https://eproceedings.epublishing.ekt.gr/index.php/openedu	4
National Documentation Centre https://www.ekt.gr/en - EKT	http://www.didaktorika.gr/eadd/handle/10442/38040	1
PENER –System of academic support for students of open and distance learning in HOU	https://elearn.eap.gr/course/view.php?id=7	5
The Open University Students' support	http://www.openuniversity.edu/study/support	1
The Open University Tutors' support	http://www.openuniversity.edu/study/support/tutor-support	1
Athabasca University Supporting Students	https://www.athabascau.ca/online-learning/how-au-works/studying-at-au/student-support/	1
Conference "School Distance Education"	https://pekesexae2020.pdekritis.gr/anastasiadis/	1
Tutoring In Open and Distance Learning: A Handbook for Tutors The Commonwealth of Learning, (2003)	http://oasis.col.org/handle/11599/121	1

4. Developing the "Guide for Effective Teaching"

The second case study presents the design and development of the *"Guide for Effective Teaching" (GET)* as a key pillar of the in-service professional development of the undergraduate course EPO12 academic staff at the HOU. Action research was conducted from March 2012 until May 2013 in the course entitled *EPO12* - "*Geography, Human Geography and the Material Culture in Europe*" focusing on authentic problems and exploring the process of developing new knowledge. The course was selected due to the following reasons:

- It is interdisciplinary and involves various scientific fields,
- Its teaching material needs to be updated and expanded, and also
- It is a key course of the most massive undergraduate program "*European Civilization*" *(EPO)* of the HOU.

The survey recorded the current situation of Tutor-Counselors and explored their proposals for professional development. A supporting environment was designed and developed enriching the teaching material using OER and proposing learning scenarios and OEP with active educational techniques during the tutorials such as brainstorming, debates, role-playing, and group working in both collaborative online or face-to-face setting. This environment supports the work of Tutor - Counselors, combining the methodology of DE, adult education principles and collaborative learning environments to the cognitive subject.
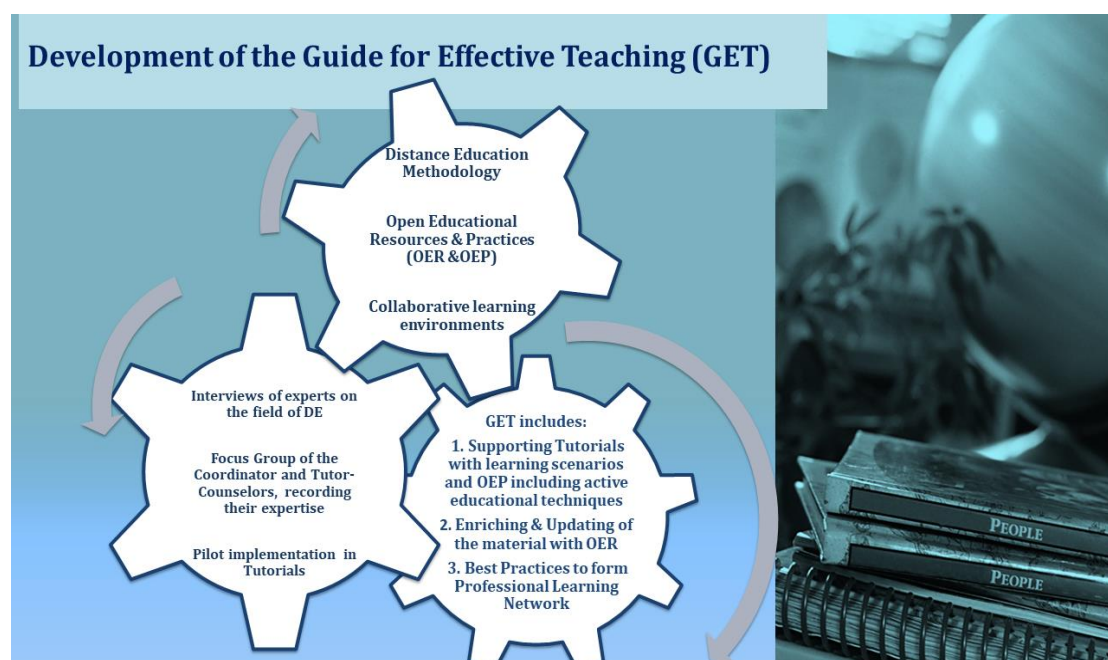
Figure 1: Steps of the development of the Guide for Effective Teaching (GET)

In the beginning of this research, Greek and foreign experts on the field of DE were interviewed in the context. Tutors - Counselors in the course EPO12 and their Coordinator have phrased rich opinions, testimonials and best practices, which they use in their teaching in tutorials and the assessment of essays. The conclusions of the international and Greek study have shaped the *"Guide for Effective Teaching" (GET)* aiming to the academic staff support. The proposed activities in the GET combine best practices from the literature review and the experience of Tutor-Counselors, and aim to enhance active and collaborative learning.

Based on OER as "social objects" the activities take advantage of the collaborative learning and encourage the creation of a Professional Learning Network.

Open Educational Resources used in EPO12, came from Digital Repositories such as the digital library Europeana, the web site of the Educational Radiotelevision in Greece https://edutv.minedu.gov.gr/, the TED talks, the National Geographic, the National Technical University of Athens (NTUA) and the Google and they are all available on the web page https://support4tutors.blogspot.com/. Some videos have been **reused** since they have been segmented in order to serve concrete time limitations of the courses. The GET includes a series of OEP based on a rich variety of OER and the pedagogical framework of experiential and active learning aiming to support Tutor-Counselors in:

- implementing face-to-face tutorials combining OER with diverse active and collaborative methodologies,
- guiding students to implement assignments,
- enhancing interactions in online Communities of Practice approaching by that socio-constructive theories of learning.

Each Tutor-Counselor is able to use, reuse, remix, repurpose the OEP and share them, extending and enriching the Repository. Tutor-Counselors of EPO12 used and evaluated GET in their classes providing essential feedback (Papadimitriou, 2014). The GET can be expanded to other distance learning environments and includes OEP planned to be adapted and reused by the broader academic community.

5. The MOOC "Teachers' training in Distance Education"

5.1 Using OER at the development of the MOOC

Teachers during the COVID-19 lockdown faced an emerging situation worldwide. They needed to acquire new digital skills working in online environments and using various ICT tools to communicate with their students. The Ministry of Education in Greece provided a free Massive Open Online Course (MOOC) in April 2020, entitled "Teachers' training in Distance Education" to all teachers of Primary and Secondary Education designed and developed by the collaboration of the Hellenic Open University and the Greek Institute of Educational Policy (IEP). The MOOC aimed at familiarizing all teachers with the key dimensions of distance school education. This unit illustrates the use of OER at the emergent design and development of this MOOC.

The MOOC was addressed to the needs of both experienced and inexperienced teachers with various teaching specialties, digital skills and knowledge/experience in DE. The Ministry of Education asked for a rapid, short fully online course with no additional supporting interactions or face-to-face learning opportunities. The members of *Scientific Supervision and Project Coordination* and also the *Educational Material Writing and Development Team* (EMW) refer (Lionarakis, Orfanoudakis, Kokkos, Manousou, Hartofylaka, Ioakeimidou, Papadimitriou, Karagianni, Stavropoulos, Karachristos, 2020: 6374):

> "The Ministry of Education and the Institute of Educational Policy invited a group of Greek distance education experts, to explore the potential of creating a training program for primary and secondary school teachers in the shortest time possible. IEP asked the Hellenic Open University experts for a detailed proposal for a 15-hour distance course for all school teachers. After collaborating closely with a team of highly qualified educators experienced in distance learning, HOU submitted the

proposal and the Ministry of Education and IEP approved it, but they requested the whole training program be prepared in 10 days due to the emergency. For this reason, three more members from the Educational Content Methodology and Technology Laboratory of the Hellenic Open University were added to the team. Despite the challenge, a 15-hour MOOC, which would be offered for asynchronous training on the HOU platform, was actually created in just 10 days".

The outline and the content of the MOOC were agreed and the five members of the EMW created and wrote the study material. It was then delivered to the Team of Instructional Design of the *e-CoMeT-Lab*, which uploaded the content of the MOOC on the Moodle platform at the URL address https://learn.eap.gr/. The IEP and the Ministry of Education supervised the progress of the work and provided feedback throughout the whole process.

Therefore, the study material should contain a wealth of compulsory reading resources, examples and learning scenarios, learning and self-evaluation activities to guide teachers more effectively. The content of the MOOC was based on OER, and was offered in many media forms as videos, images, schemes, presentations and examples for all educators. Teachers with no experience in DE and ICTs acquired the basic knowledge and a wide range of good practices. On the other hand, the MOOC provided additional OER addressed to teachers already familiarized with ICTs suggested for further study. OER used came from the following Repositories:

- The Aggregator of open educational content: http://photodentro.edu.gr/
- The Educational Radiotelevision web-site: www.edutv.gr
- The Open Education / The Journal for Open and Distance Education and Educational Technology
- The Proceedings of the International Conference of Open and Distance Learning
- The National Documentation Centre - EKT
- The System of academic support for students of open and distance learning in HOU (PENER)
- The Kallipos Repository: https://repository.kallipos.gr/
- The Greek schools' network: https://www.sch.gr/
- Open Courses from University of Macedonia: http://opencourses.uom.gr
- The School Education Gateway: https://www.schooleducationgateway.eu/

The MOOC proposed Learning scenarios and OEP from the following platforms:

- The AESOP platform of the Institute of Educational Policy: http://aesop.iep.edu.gr/ &
- The Repository of Open Educational Practices: http://photodentro.edu.gr/oep

The course consisted of seven (7) stand-alone Thematic Units. Each Unit contains a brief description, the expected results and the keywords on its main page. The Thematic Units cover the following topics (Lionarakis et al, 2020: 6376-6377):

1. School Distance Education: theory and basic assumptions
2. Learning design in School Distance Education (SDE)
3. Educational material in SDE: specifications, development and utilization
4. Personal data protection and copyright issues
5. Evaluation and feedback in SDE
6. Digital Environments
7. SDE and family environment: students' well-being.

More analytically, the first unit presents principles, basic assumptions and types of the SDE and approaches international and national practices of implementation. Moreover, it focuses on learning communities and puts emphasis on teachers' online communities created during the pandemic of COVID-19. The content of the first unit has been enriched with pictures, hyperlinks and interviews with experts in the field.

The second unit analyzes the learning design in SDE, which consists of one of the most critical aspects of this method. Two presentations enrich the material of the second unit with learning scenarios of SDE in the subjects of English and Physics, for both primary and secondary levels of education provided as OER.

The specifications, development and utilization of the educational material in SDE are presented in the third unit. Digital Repositories of OER are presented and discussed, focusing on the Greek aggregator of repositories entitled "Photodentro". The paradigm of the Educational Radiotelevision is presented promoting a wealth of digital videos to teach and engage pupils in kindergarten.

The fourth unit approaches personal data protection and copyright issues. The six types of Creative Commons Licenses are described and depicted in a detailed Infographic. The fifth unit follows, dealing with issues of evaluation and feedback. The sixth unit examines Learning Management Systems (LMSs) in relation to learning theories. The key roles of administrators /tutors and students are described and their access rights to various levels of the LMSs are discussed. Moreover, the LMSs, e-class and e-me, are presented thoroughly in capturing screen video format.

Finally, the seventh unit explores SDE and the relevant changes in the family environment. This unit highlights ways, characteristics, content and examples of communication between teachers and parents. Plus, it presents activities and educational material that promote students' wellbeing as well as proposals aiming to support families.

At the end of each Unit there are self-assessment questions. Participants submit their answers and they get feedback automatically by the system. Furthermore, four Infographics illustrate how online lessons in Mathematics, English and History can be designed. There is also a general design template suitable for all subjects. The infographics outline all key areas, such as goal setting, selection of the educational material, time schedules, synchronous and asynchronous communication as well as evaluation and feedback activities. All infographics were created to address learning goals of the MOOC and they are available as OER for further utilization by other programs.

5.2 **Evaluation of the MOOC**

The participants filled in an evaluation questionnaire consisting of 22 compulsory questions answered in a five-point Likert scale. The evaluation results are the following (Lionarakis et al, 2020: 6378-6379):

In total, 4.949 of the participants answered the questionnaire, 23% of them were men and 77% were women. A percentage of 51% of the participants teach in Primary Education and the rest at the Secondary Education. Moreover, 30% of them are Primary school teachers, 17% Greek Language teachers, 9% kindergarten teachers, 7% English language teachers, 6% Math teachers and the rest belong to other categories.

A percentage of 32% of the participants attended a MOOC for the first time. The statement that "*the goal and expected results of the training program were clearly stated and the content of the training program was consistent with the expected results*" was ranked with an average

score of 4.6 from 1 to 5. The structure of the training program was also ranked with an average score of 4.6. They argued that "*the content was organized in a clear, logical and structured way, covered the expected results, it was covered at the right pace and the examples and videos that were provided contributed to the understanding of the content*".

Participating teachers voted Thematic Unit 3 (59%) and 2 (52%) were the most useful to them. Next units came Thematic Unit 5 (46%) and Thematic Unit 4 (44%) while less useful seemed to be Thematic Unit 6 (34%), 7 (24%) and 1 (10%). Regarding the Study Material, Activities, and Self-Assessment Exercises, a total score of 4.5 was given. The participants argued that the learning material was available in a friendly format, and it helped them to understand the basic principles of SDE. Furthermore, learning and self-evaluation activities and also the external resources for further study helped them to understand in depth the content of the training program (Lionarakis et al, 2020).

6. Conclusions

Researches (Hartofylaka, 2012; Papadimitriou, 2014; Ioakeimidou, 2018) highlight that the development and adaptation of OER support students' studies and the tutors' complex role. The use and reuse of OER for each cognitive field combined with proposals for personalized or collaborative learning could serve as a useful guide for teaching and professional development of educators.

The first case study illustrates the use of OER to develop the educational material in two post-graduate courses of HOU with the necessary instructional design to integrate it into high-quality online programs.

The second case study presents the development of "*The Guide for Effective Teaching" (GET)* based on action research in the HOU. The GET includes useful learning scenarios and OEP that could create effective environments to support the work of Tutor-Counselors in EPO12. The combination of OER as "social object" with active learning techniques is an innovative element in the research, which can be expanded to various online courses. Developing OEP based on OER provide to Tutor-Counselor, a repository of good practices, which they are able to expand, adapt, reuse, repurpose and remix with their everyday work approaching by that pedagogical innovation and creativity. In parallel, emphasis was given in the social context, which influences each cognitive process. All three generations of pedagogy, i.e. behaviorism, constructivism and connectivism are necessary to cover the whole spectrum of educational needs of students in the 21st century. Combining pedagogies is crucial for the development of flexible content-based OEP.

The third case study highlights the development of a MOOC, which offered to all Greek teachers a multilateral approach to SDE combining theoretical underpinnings and examples of various teaching subjects for the first time.

All aforementioned case studies in HOU show that the OER have the potential to support both teaching and professional development of the academic/teaching staff in undergraduate and postgraduate courses or schools purposefully with concrete methodologies. All methodologies proposed can be adapted and expanded, providing guidance and orientation for institutions that would wish to develop their own strategy. OER were thoroughly selected and properly used to serve the learning objectives and in addition, new OER were created for further adaptation within all three case studies. A general guidance proposed by the three case studies of this article could be the following:

- Defining the members of the Teams of DE experts (DEE) and Educational Material Writers (EMW)
- Setting the goals and learning objectives (by DEE & EMW)
- Discovering and selecting OER in Repositories to achieve the goals (by EMW)
- Using OER to develop educational material (by EMW)
- Developing learning scenarios and OEP on selected OER to promote OER-based learning (by DEE & EMW)
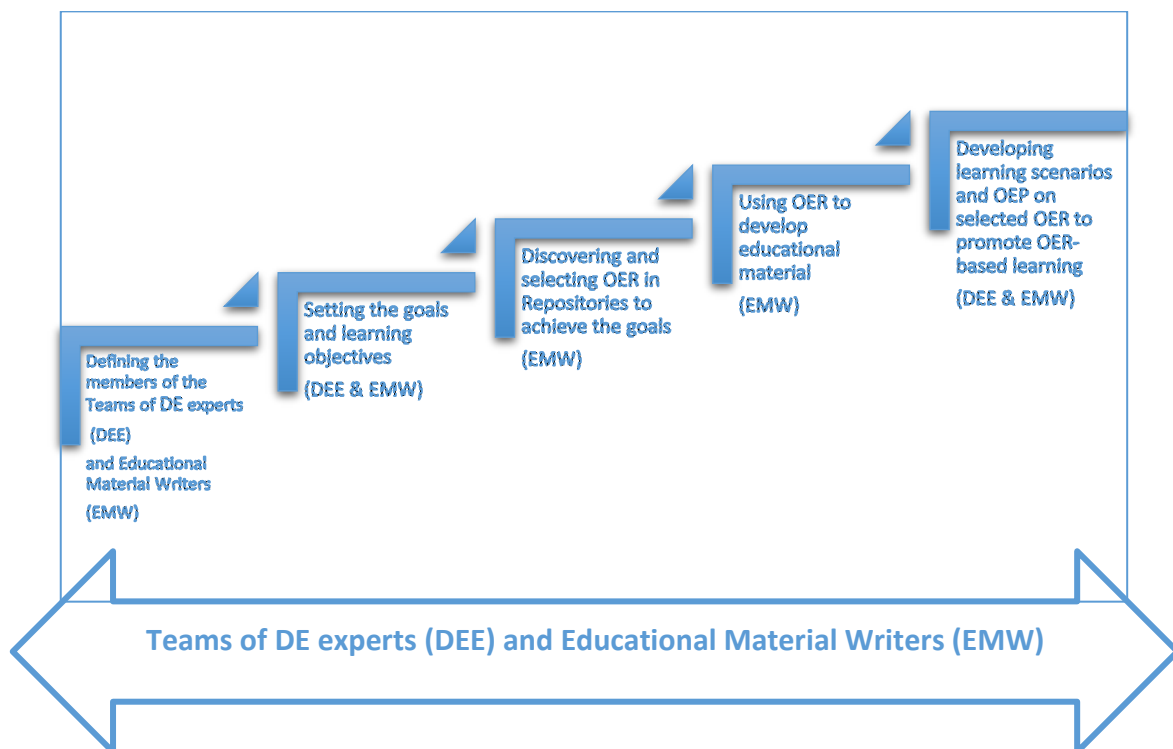

Figure 2: Guidance for the development a strategy of using OER in educational material

OEP & OER Repositories support educators to organize and conduct courses using the existing educational material and discovering constantly new ones, since educators can contribute with their own. Furthermore, OEP/OER Repositories are exclusively designed to support educators' role providing practices and resources to enhance networking, peer learning and mentoring and create meaningful, collaborative and situated in real life, environments. OER as social objects support educators' participation, reflections and interactions in Communities of Practice among educators and facilitators during the overall learning process (Papadimitriou, 2013; Papadimitriou & Lionarakis, 2013). Within communities, educators could shape a common approach in teaching, evaluating, facilitating and mentoring practices. Using OER, educators could build and maintain Professional Learning Networks, aimed to exchange best practices and expertise in specific disciplines at a global dimension. Enhancing educator's work with OER and OEP has a crucial impact and improvement to student's engagement and performance, as well. They study in an effective collaborative environment, rich with new media, using a wealth of trusted and reliable resources.

OER should be included in quality assessment and quality enhancement mechanisms (Ossiannilsson, Williams, Camilleri, & Brown, 2015). OER and OEP present the strategic

opportunity to facilitate the conversation regarding educational policies and include the benefits of sharing and collaborating among higher education departments and countries (Redecker & Castaño Muñoz, 2013). The creatively disruptive role of OER & OEP opens up new educational models towards the vision of an open global higher education grasping the opportunities offered by the digital revolution.

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KALLIPOS: The Project that is shaping the OER landscape in Greece

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Abstract

This contribution aims at presenting KALLIPOS, a large-scale initiative for developing high quality digital academic textbooks and making them available through open licenses. The presentation analyses the complete workflow of the Project, highlights its unique characteristics and presents participation and usage statistics, with the aim to evaluate its contribution to shaping the Open Educational Resources (OER) landscape in Greece. The main challenges and lessons learned by this innovative Project are summarized, while some more conclusions on the role of OER are derived.

Keywords: KALLIPOS, Open Educational Resources (OER), open academic textbooks, open licenses, digital Repository

1. Introduction

Education for all or *Open Education* is a slogan used to express one of the fundamental human rights as stated in the Universal Declaration of Human Rights (UN General Assembly 10/12/1948, Paris):

> "*Everyone has the right to education. Education shall be free, at least in the elementary and fundamental stages. Elementary education shall be compulsory. Technical and professional education shall be made generally available and higher education shall be equally accessible to all on the basis of merit*" (Article 26).

Since then, many movements and organizations have made it their flag and core target: UNESCO, Commonwealth Of Learning, Open Education Consortium, to name a few. However, an important shift in the motives and the supporters of Open Education is being realized nowadays. From a pursuit of volunteers and non-governmental organizations, it is becoming part of the strategic plans and initiatives of systemic bodies and governments as an important instrument of growth. This is not accidental. In the Society and Economy of Knowledge, Open and Continuing Education is playing a vital role and, as such, it has been included in the list of Sustainable Development Goals (SDG) of the UN Agenda 2030 (**UN, 2015**):

> "*Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all*" (SDG 4).

Moreover, for this particular SDG, OECD notices in its 2017 report "*Education at a glance: OECD indicators*" (**OECD, 2017**):

> "*Making SDG 4 a reality will transform lives around the globe. Education is so central to the achievement of a sustainable, prosperous and equitable planet that failure to achieve this particular SDG puts at risk the achievement of the 17 SDGs as a whole*".

Open Educational Resources (OER) are one of the basic pillars of Open Education. They include open textbooks and e-courses, open-access scholarly publications, video lectures, presentations, images, infographics, interactive games, quizzes, tutorials, learning tools, open software add-ons, podcasts, etc., in which "*one has a free, formal grant of permission to engage in the 5R activities (Retain, Reuse, Revise, Remix, Redistribute)*" (**Wiley, 2018**), as opposed to "*traditionally copyrighted resources*".

The power of openness lies in its inherent multiplying effect: anything open in the aforementioned definition can be grown exponentially by the contribution of the entire Community. Working this way, the open Internet is becoming the locomotive of the 4th Industrial Revolution. There are, however, two main challenges that have to be addressed, in order to make the OER a reliable, complete and persistent body of scholarly knowledge:

(a) *Funding: Who pays for the creation and maintenance of the open material*. Given the fact that the creator of the material does not expect any profit in return, after releasing her/his work to the public, someone has to pay for it in advance. Moreover, someone has to take care of the material, to be up to date and accessible by the Community, in the long term.

(b) *Quality: What measures are being taken to assure the desired quality of the open material*.

In this contribution we present **KALLIPOS**, a large-scale, nation-wide Project which is active in the framework of OER (with specific focus on the open academic textbooks for Greek Universities) and explain how it addresses the aforementioned challenges. In **section 2**, the scope and the main characteristics of the Project are summarized. The Project workflow is presented in **section 3**, highlighting the emphasis of the Project on the quality of the produced textbooks. **Section 4** presents the main publishing methods used, as well as the digital Repository through which the educational resources are made available to the public. **Section 5** gives some participation and usage statistics. A **final section** summarizes the main conclusions and reports on some important lessons learned through the course of the Project.

2. Evolution, scope and main characteristics of KALLIPOS

The Project has been developed in two phases. In the first phase (2013-2015) it was co-funded by the EU and the Greek State and had the impressive outcome of 520 undergraduate textbooks, written in Greek (**Koutsileou, Kouis, & Mitrou, 2018**).

In the current, second phase (2020-2022), named **KALLIPOS+**, an even bigger objective has been set: to develop more than 700 academic textbooks of a broader scope and type, which are expected to become available within less than a year from now [the first sixty of them are already in the **KALLIPOS Repository** Apart from undergraduate textbooks, which still constitute the main target category of the Project, new categories have been included in its scope, like postgraduate-aiding books, monographs and extended bibliographic guides. Books will be available in other languages as well, apart from Greek. After the completion of this phase, more than 1200 high-quality, digital textbooks will be available for open use by everyone: students, teachers, researchers, lifelong learners, science lovers. The subjects covered by the KALLIPOS+ books belong to all sciences, as shown in the pie-chart of **Figure 1**, typically classified in six (6) Thematic Areas. The existing books of the first phase follow a similar, more or less, distribution.
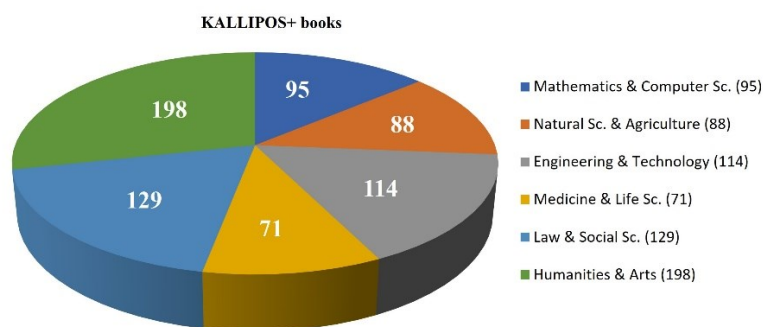
Figure 1. Thematic distribution of KALLIPOS+ books.

After the addition of the new content, the **KALLIPOS Repository** will probably become the biggest Repository of its kind in the world. Just for comparison, **Table 1** summarizes the size of some well-known open textbook Repositories around the Globe.

Table 1. Open textbook Repositories and their size
(sampled on 5/9/2022).

Repository	# of books
Open Textbook Library	1087
Teaching Commons	541
Libre Texts	398
BC Campus	382
GALILEO Open Learning Materials - University System of Georgia	107
American Institute of Mathematics	60
Washington University in St. Louis	47
Milne Open Textbooks	46
College of the Canyons	40
Open Oregon	39
KALLIPOS (after publishing the KALLIPOS+ books	>1200

The main characteristics of KALLIPOS are summarized below:

- A huge human network of contributors - more than 2000 persons: authors (mainly Professors), evaluators, language and technical editors, librarians, ITC experts, …
- A well-defined workflow, from the open calls for authoring proposals until the final stage of book editing and uploading on the Repository (see next section).
- A dedicated Steering Committee of more than 40 distinguished members of the Academic and Research Community with a long teaching experience, who supervise and guide the Project workflow.
- Three publishing lines, originating from different primary formats and resulting in printing-quality PDF and EPUB formats: Word/InDesign, LaTeX and xml-based DocBook (see section 4).
- Quality assurance of the produced material, through setting specific educational criteria and evaluating proposals and delivered material against them.

- Structuring of the material in terms of learning objects (book chapters, tables, multimedia and interactive components, …), annotated by a rich set of metadata in order to facilitate easy search and retrieval.

3. Project workflow and quality standards

This section summarizes the workflow of the Project, with emphasis on those actions that aim to keep some quality standards for the created books.
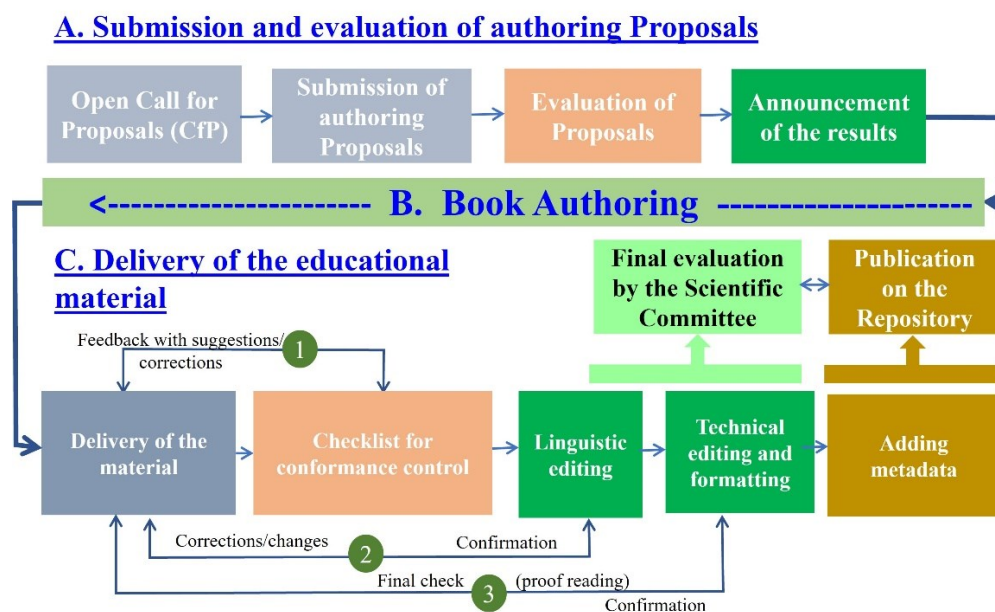
3.1 Project workflow

Figure 2 shows the basic workflow of the Project. It consists of three stages:

<u>Stage A</u>: *Submission and evaluation of authoring proposals*. Open Calls for Proposals (CfP) are issued, with a specific deadline and a specific budget per Thematic Area. The budget offered for each book is of the order of 10K€ (8K€ for authoring and 2K€ for editing and formatting), with small variations depending on the size and the category of the book. The submitted proposals are delivered to the Project Scientific Committee (SC) for evaluation. External evaluators are engaged to assist the SC members in their evaluation task, whenever necessary.

<u>Stage B</u>: *Authoring*. It lasts from 4 to 18 months, depending on the maturity of the existing educational material and the size of the authoring team.

<u>Stage C</u>: *Editing and Publishing*. It is performed by the Central Support Team of the Project and professionals in Linguistic and Technical editing. Then, experienced librarians are engaged to add appropriate metadata and publish the book on the digital Repository.

Figure 2. The basic workflow of the Project.

3.2 Quality standards and controls

At this point, it is important to highlight the specific actions and filters within the above workflow, that aim to maintain quality standards of the produced material.

1. *Proposal eligibility requirements*. The main author of a proposed book, who is responsible for the coordination of the authoring team and the submission and implementation of the Proposal, should belong to specific categories of the teaching and research staff of Universities and State Research Centres. The co-authors should hold a PhD or MSc degree in a related subject. Moreover, any proposed undergraduate textbook should cover at least one one-semester course included in an existing Study Programme of a University Department. There are also limits concerning the maximum number of Proposals and the maximum budget that any physical person could get from the Project.

2. *Proposal evaluation criteria*. The Proposals are evaluated according to specific criteria, explicitly reported in the CfPs (summarized in **Table 2** below).

Table 2. Criteria for Proposal evaluation.

Category	Criterion
Authoring team qualification	Relation to the proposed book subject; teaching and research experience
Proposed book subject and structure	Importance and timeliness of the subject; structure and inclusiveness of the content
Expected use	Expected number of courses and students, that will use the proposed book
Maturity and time plan	Maturity of the existing material (lecture notes or book chapters); authoring time-plan
Special features	Use of multimedia and interactive components
Open license	A bonus is given for the most open Creative Commons license

3. *Authoring and editing standards*. Detailed instructions are given to the authors beforehand, for structuring and formatting their books. An intermediate deliverable, half of the proposed book in terms of complete chapters, is a contractual commitment by the authors (this step is not shown in the workflow of **Figure 2**). At this stage, a first compliance check is performed by the Central Support Team (CST) and a respective notification is sent back to the authors for corrective actions and improvement. The most important and thorough processing, however, is performed after the delivery of the final material by the authors (stage C in **Figure 2**). At this stage, after a general check of the compliance of the delivered material with the approved proposal and the evaluators' comments, the book is handed over to the linguistic editor first and then to the technical editor. The editors are selected by the authors from a pool of professionals registered at the Project's Registry. The editing is performed through successive cycles of cooperation between the authoring team and the editors, under the continuous monitoring and the support of the CST. Finally, librarians are engaged to add metadata and publish the book on the Repository. In parallel to these editing steps, the content is roughly checked and approved by the SC members.

4. Publishing methods and the digital Repository

The main publishing methods of the Project are schematically shown in **Figure 3**. There are two primary formats which the authors can choose from for their writing: LaTeX or Microsoft Word. The first is chosen mainly for mathematical documents and can produce high quality printable formats (PDF). MS Word documents, on the other hand, can follow three different lines of processing: (a) to be processed and transformed into PDF; (b) to feed Adobe InDesign, a professional desktop publishing tool which can create

high-quality graphics and give output documents in PDF or EPUB[1] form; (c) to be transformed into an XML-based format and processed with DocBook[2].
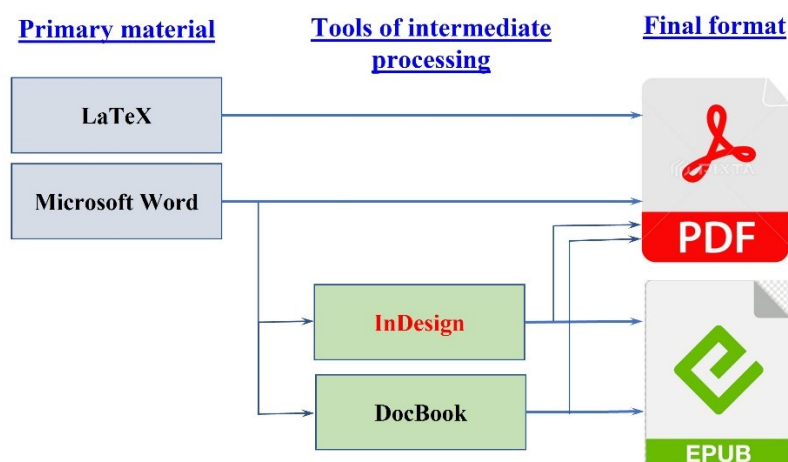
Figure 3. Publishing methods used in KALLIPOS.

From the three publishing methods used in KALLIPOS, the last one, DocBook, is the most promising one, due to its versatility in producing various output formats and the ease in making revisions, a very desirable feature for content preservation and updating.

The **KALLIPOS Repository** is built on the open-software platform DSpace - latest version 6.3. The content consists of books, chapters and other learning objects (video and audio clips, interactive objects, mathematical objects, …), organized in the six (6) subject categories (or Thematic Areas) shown in **Figure 4(a)** (the same as in **Figure 1**). A rich metadata set is used to annotate the learning objects, facilitating search and retrieval. In the initial page of a book [**Figure 4(b)**] one can see the book cover and its basic metadata (title, authors, ISBN, thematic terms, keywords, abstract), as well as labelled tabs for viewing or retrieving the full text, the Table of Contents, a concise leaflet (brochure) of the book in Greek and English (see example brochure in **Figure 5**) and a book presentation by the authors themselves in ppt and/or video (a new feature available for the KALLIPOS+ books only). Other supplementary features, like usage statistics in terms of book views and downloads, are available to the authors upon demand.

Work is in progress aiming at enriching the Repository with advanced AI mechanisms for semantic classification and searching at chapter and learning-object level. With the aid of these advanced tools, teachers and students will be able to find the most relevant content to their specific work subjects and courses, not only within the KALLIPOS Repository, but in other repositories and databases as well [see **Giannopoulou, Makris, & Mitrou (2022)** in this Conference].

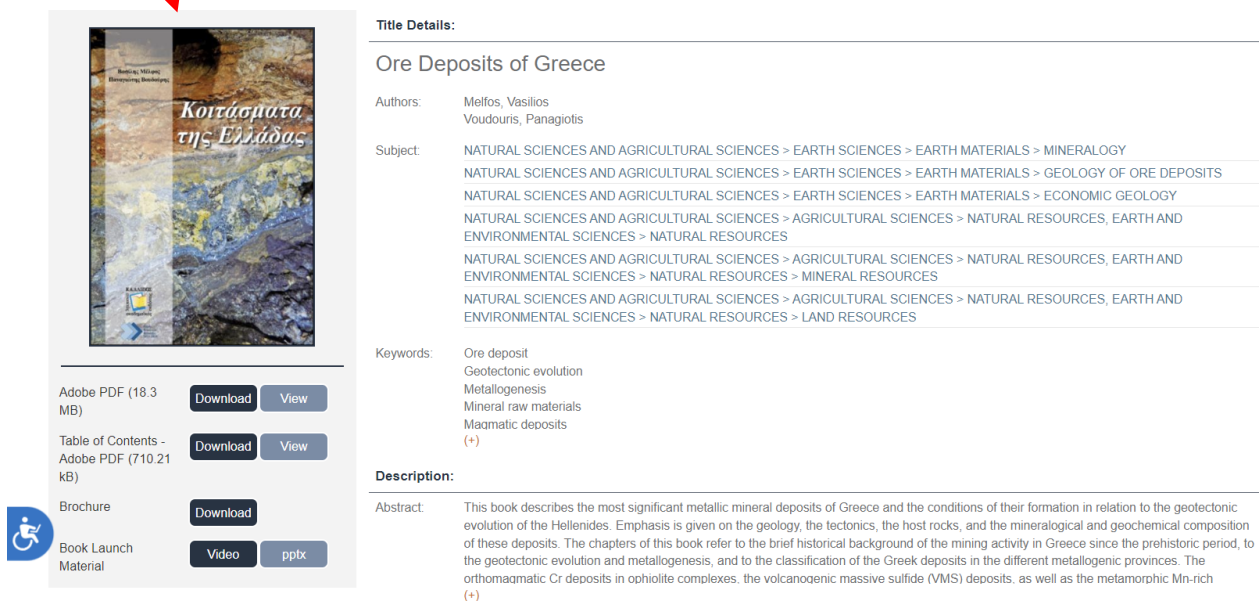[1] EPUB (from *Electronic PUBlishing*) is a vendor-independent XML-based e-book format, promoted by the International Digital Publishing Forum (IDPF).

[2] DocBook is an XML-based semantic language that enables its users to create document content in a presentation-neutral form.
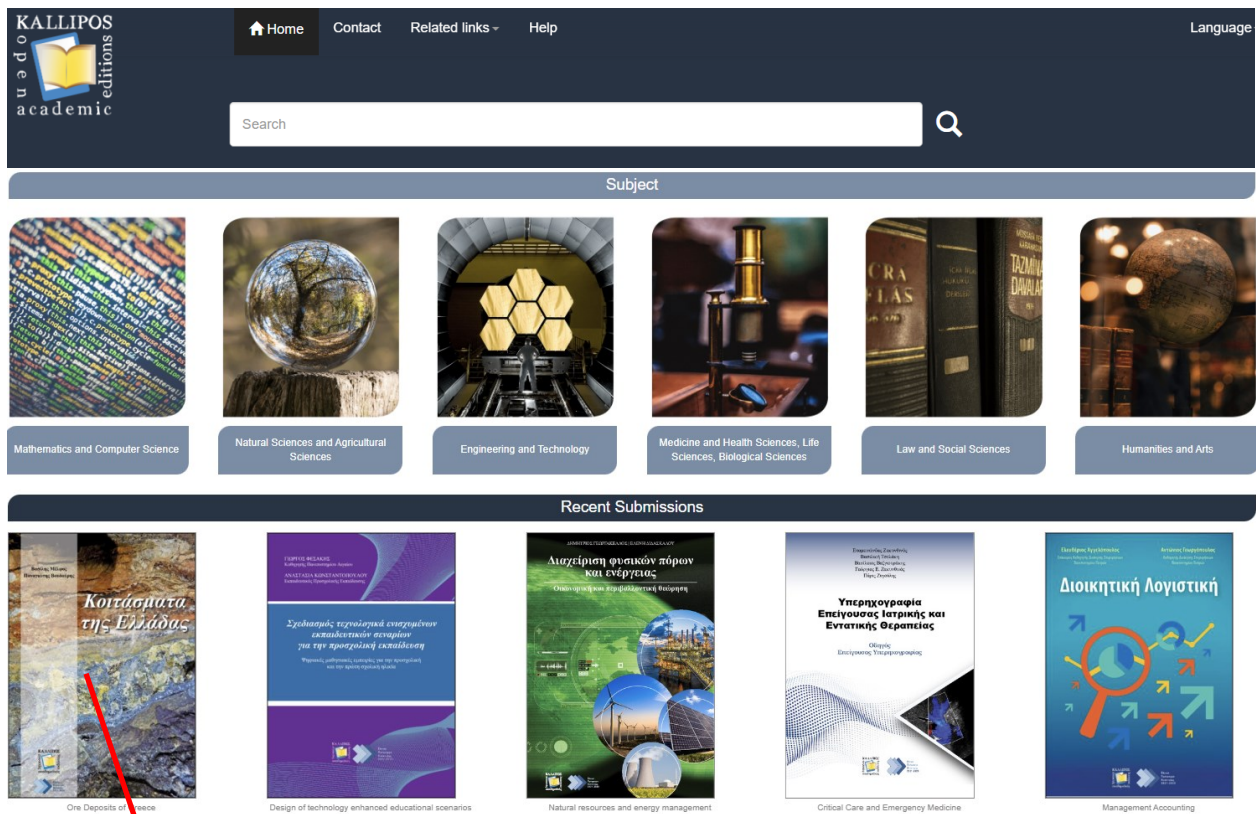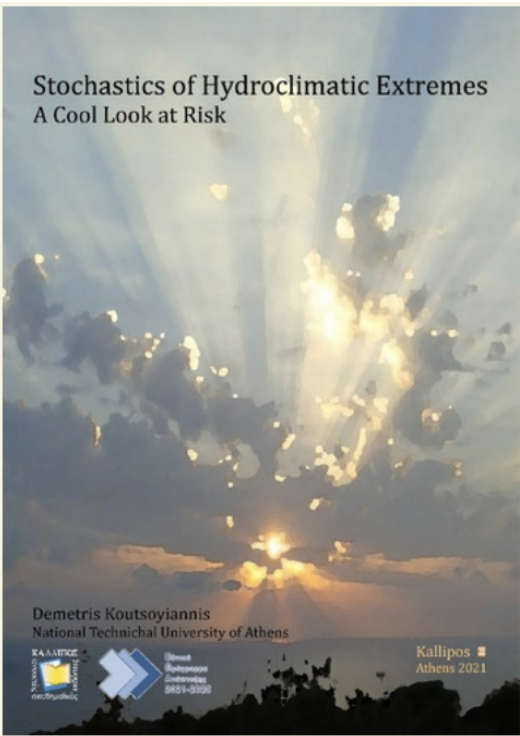
(a)   Repository home page

(b)   Book initial page

Figure 4. The KALLIPOS Repository (a) home page (b) initial book page.

METADATA

Title: Stochastics of Hydroclimatic Extremes - A Cool Look at Risk

Other Titles: -

Language: English

Authors: Koutsoyiannis, D., Professor, NTUA

ISBN: 978-618-85370-0-2

Subject: MATHEMATICS AND COMPUTER SCIENCE, NATURAL SCIENCES AND AGRICULTURAL SCIENCES, ENGINEERING AND TECHNOLOGY, LAW AND SOCIAL SCIENCES

Keywords: Stochastic processes / Stochastic analysis of extremes / Extreme hydroclimaticphenomena / Hydroclimatology / Hydroclimatic design of infrastructure works

Abstract

Much is said and written about hydroclimatic hazards: storms, floods, droughts. Such hazards have existed and will always exist, while the usual scaremongering on them is of little help to avoid them. Instead, what is needed is a cool look at risk, based on measurement data, using scientific methodology, and ultimately employing technology in the service of reducing hazards and their consequences. This is attempted in the book. Much of it is devoted to the theory of stochastics —the mathematical language for analysing extremes. Stochastics is a scientific area broader than statistics —according to the definition adopted in the book, statistics is part of stochastics. Another part is the theory of stochastic processes, in which time has a hypostasis that is typically absent in statistics. Thus, statistics is in relation to stochastic what statics are in relation to dynamics. The commonly used classical statistics (based on the assumption of independence) is a special case of stochastics and, as the book proves, is inappropriate for the subject. This does not mean that statistics are abandoned or underrepresented in the book. On the contrary, several new developments are presented —most notably the new tool of knowable moments, which have two relevant characteristics: they are closely connected to extremes and their estimation is unbiased in the framework of classical statistics or involves small (and determinable) bias in stochastic processes with dependence in time, whilst the bias in the estimation of classical statistical moments can be huge. The new theoretical analyses are supported by mathematical proofs, which, to improve readability, are contained in a number of appendices in each of the 10 main chapters of the book. Along with the development of the theory, the book is oriented to the application, which is supported by a variety of examples, usually standing out as parenthetical sections or Digressions, as well as by tabulations of mathematical formulae that are used for each task.

Figure 5. An example of a book brochure, provided by the KALLIPOS Repository.

5. Participation and usage statistics

5.1 Participation of authors/Institutions

As mentioned in section 2 – main characteristics of the Project – a huge network of contributors has been set up and activated in the framework of this ambitious Project. In phase 2 alone, more than 1200 authors, mainly professors from all Greek Universities (and some from abroad), are intensively working to create the (more than 700) books of KALLIPOS+. The bar-charts of **Figure 6** depict the distribution of this precious staff to profile categories and Institutions.

(a)

(b)
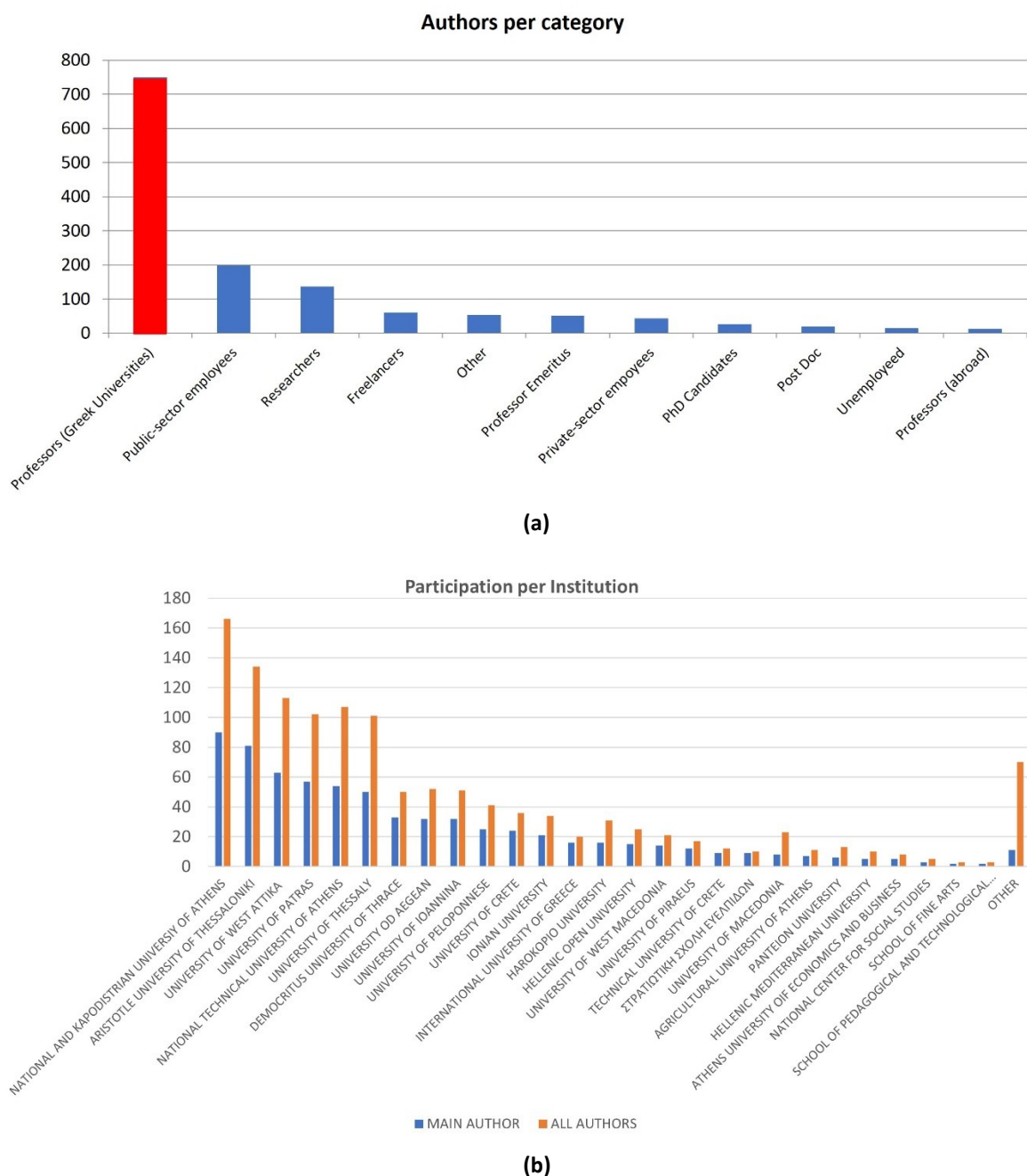
Figure 6. Participation in authoring: (a) per author category (b) per Institution.

5.2 Content usage statistics

Statistical data, derived from Google analytics of views and downloads of content components, reveals the extensive use of the KALLIPOS content, from a variety of Community groups, not only from academics. The following charts showcase this use. The time evolution of book downloads [**Figure 7(a)**] is characterized by peaks and fades, following the starts of the semesters and vacation periods, respectively. The two clearly distinguished peaks (shown in red) correspond to the respective pandemic peaks and the difficulties in printed book supply during these periods. In the per-country distribution of users [**Figure 7(b)**], we can notice a considerable use from Cyprus, because of the language of the content (in Greek). Finally, the per-age distribution [**Figure 7(c)**] shows a noticeable use in any age (teachers and life-long learners).

(a)

(b)

(c)
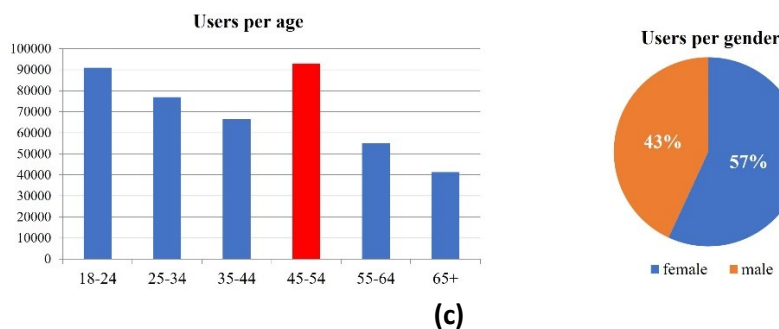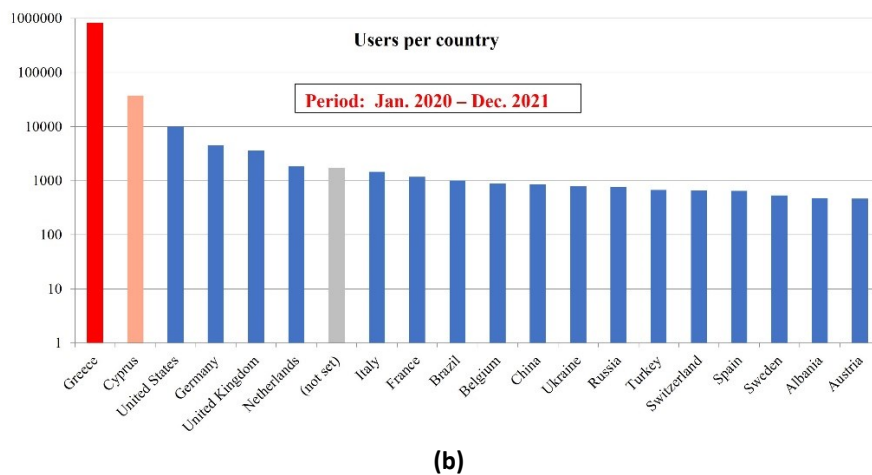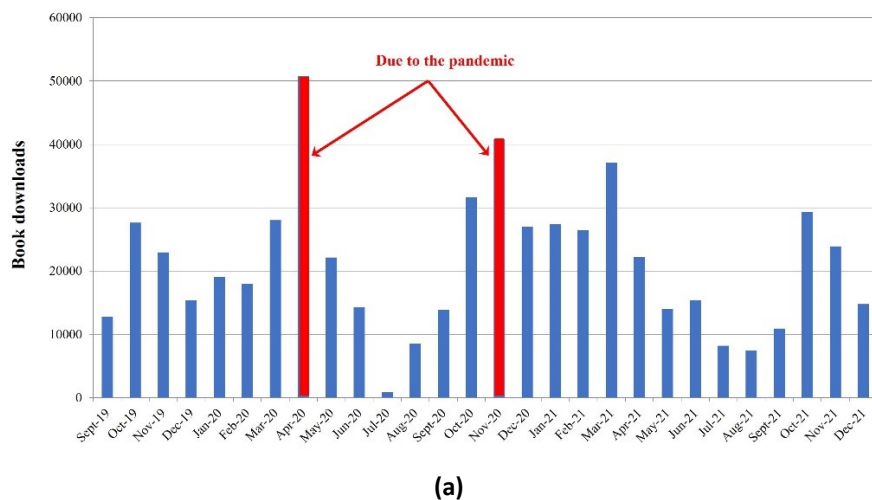
Figure 7. Distribution of Repository usage (a) book downloads over time (b) users per country (c) users per age and gender.

Finally, it is useful to see the usage of the KALLIPOS books in undergraduate courses, according to the respective proposals of the teaching staff. The bar-chart of **Figure 8** shows the percentage of the University courses for which an open book of the KALLIPOS collection is proposed for use by the students. To better understand this diagram, take for instance the percentage 5.3% in 2021, which has been derived as this: out of the 40.732 undergraduate courses available in the Study Programs of all University Departments in Greece, in 2.155 of them at least one KALLIPOS book is proposed for use by the students. It is important to note that the 520 books of KALLIPOS (only the books of the first phase are available so far) represent a proportion less than 4% of the active titles used in the undergraduate courses (mainly commercial, in print format). We can see a steady increase of KALLIPOS books with time.
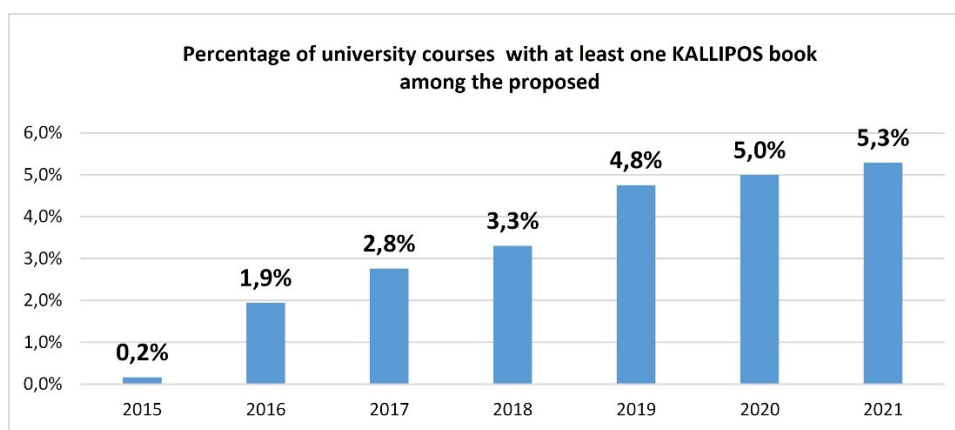
Figure 8. Usage of KALLIPOS books in undergraduate courses.

6. Synopsis: Lessons learned and conclusion

6.1 Lessons learned

This sub-section summarizes some critical lessons learned by the authors from their involvement for more than a decade in the field of OER through the KALLIPOS Project.

- A repository of academic OER (especially of open textbooks) can be useful not only to the narrow Academic and Research Community (students and teachers), but also to the Community as a whole. Among the candidate users are: people involved in programs of Continuing Education and Lifelong Learning; individual professionals who want to update their knowledge in the field of specialization, or even to make a shift in their profession; science lovers, for their personal education; and many others. **Figure 7(c)** is revealing of the age range of such users, while a recent research about the use of the open textbooks of KALLIPOS by the Continuing Education Programs in Greece has given the amazing percentage of more than 80%!
- Building an OER repository should meet some minimum requirements and conditions, in order to be successful and viable, like:
  - Securing persistent funding for content creation and maintenance. Sporadic grants from donors and sponsors are not sufficient for a continuous operation with professional standards. Public funding seems to be appropriate, given the fact that an OER Repository is an excellent investment for the profit of the entire Community.
  - Keeping a Support Team active, with specific skills – evaluators, content editors, IT experts.

       o   For Higher Education, in particular, a critical volume of content should be developed and offered, covering as many disciplines as possible, in order to obtain a real impact and a considerable contribution to the target of Open Education. KALLIPOS has set a threshold for this critical volume at 10% of the titles used in the undergraduate courses of all University Departments, until 2023, and at 30% in the longer term.

- Horizontal actions with the participation and synergy of as many Universities as possible can obtain economies of scale and save resources.
- Quality is a very critical aspect that should be taken care of.

6.2 Conclusion

KALLIPOS is a large-scale Project with the objective to create e-books for the undergraduate/postgraduate courses of Greek Universities and offer them with open licenses. It is being funded by European (in the first phase) and State funds and is following an elaborate workflow to assure quality of the produced books. In this respect, KALLIPOS has effectively addressed the two main challenges related to the provisioning of OER: funding and quality. After the completion of its current (second) phase, the digital Repository of KALLIPOS will contain more than 1200 textbooks and monographs, well organized in chapters and other educational objects for easy search and retrieval. Such a voluminous corpus of textbooks represents about 10% of all the titles used in the undergraduate courses in Greece. Being offered with open licenses, the books of KALLIPOS are being widely used by postgraduate students and lifelong learners alike. In this respect, with the volume, the quality and the widespread use of its resources, KALLIPOS will substantially contribute to the paradigm change in Higher Education towards the final target of Open Education / Education for all.

KALLIPOS, however, is much more than the books it produces. It is a big, lively network of scholars in various roles (authors, evaluators, editors), being involved in an intensive, cooperative, authoring activity, which improves them as authors and teachers alike.

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Acknowledgement

Micro-credentials for continuous education (Short Learning Programmes and MOOCs)

Question of Leadership:
Strategic Positioning of University Micro-Credentials

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Abstract (Calibri, 12 pt, bold)

Why should European university leaders position their institutions for the micro-credentials market? Indeed, the rhetoric is deafening from all sectors for a revolution in the credentialing space, which in turn is serving as a catalyst for universities to engage, adapt and enter the emerging micro-credentials market to better serve learners, employees and perhaps most importantly, employers. From the outset, leaders need first to ask: C*an micro-credentials help position an institution's academic, public service, and economic and workforce development market positions for the future? Furthermore, if an institution is committed to offering open education in an egalitarian fashion, then equivalent certification is a must!* Conversely, are there minefields, and hidden pockets of quicksand that suggest perhaps this market is not an optimum choice for an institution? This workshop is about leadership more than micro-credentials. It is divided into three parts. Part I will discuss key considerations and questions leaders must analyse and assess before making the decision to enter the micro-credentials space. What is an optimum organisational structure? How much will it cost? Who will pay? Learners? Employers? If society expects institutions to provide micro-credentials for free, then maybe it is the governments or local authorities that should cover the expense. Who will lead this change process for the institution? What is the institution's current training/outreach capacity to business and industry? Part II will focus on the criticality of reframing institutional partnerships, particularly those with employers and competitors, to explore local and regional approaches to reshaping the credentials space. For example, how does this support the regional economic development strategy, create jobs, and provide new employee advancement opportunities? The customer is always right in re-emerging in this new credential space, and universities must put learners, employees and employers front and centre. Part III of the workshop will explore new institutional vantage points for mobilising and integrating micro-credentials with existing online and open education operational capacity. The floor will be open for Q&A with the participants during each Part of the workshop to foster an interactive exchange and dialogue.

Keywords: micro-credentials, strategy, leadership, higher education institutions, business models,

Current state of the microcredentialing system in Europe

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Abstract

The 21st century has seen an explosion of knowledge and a way to transfer it, a situation comparable to the spread of movable type printing in the 15th century. Promoting online education means providing training opportunities for everyone, including those who would normally be excluded from the credential system. It is precisely within this framework that the microcredentialing system is situated. Relevant elements emerge from the latest Horizon report (Pelletier et al., 2021) to map the current state of microcredentialing in the world. First, investment in micro-qualifications is expected to grow substantially over the five-year period 2021-2026 (Holon IQ, 2021). With this in mind, starting from the Horizon report, this paper declines through an exploratory survey aimed at learning about the training implications and future developments of the microcredentials system.

In particular, the survey places a focus on the microcredentialing system in Europe with a particular lunge on the prospects of online education and the future prospects of microcredentialing in Italy and Europe. Systems such as Bestr, the first digital credentialing platform born in Italy, at the behest of the Cineca consortium, and best practices related to MOOCs are taken into analysis: such as Federica, an online learning platform, and EduOpen, a project funded by the Ministry of Education, University and Research aimed at the realization and fruition of MOOCs. However, it is necessary to conduct in-depth studies on the microcredentialing system, analyzing the models, means available and tools that can be used by making a comparison with current Italian, European and international conditions.

Keywords: microcredentialing, online education, MOOC.

1. Introduction. Online education: Agile management of training processes

The contemporary individual, immersed in the magmatic matrices of the Internet, lives in an almost unconscious state of intra- and interpersonal *amplification.* Human society of the 21st century tends to no longer be satisfied with one-dimensional realities or univocal sources of knowledge, finding itself more at ease with multiplicities and hybridizations, which in terms of training are identified with composite cultural backgrounds and transversal skills.

The very word "internet",[1] that incorporates the word *net* of "network", which is synonymous with the *web,* suggests an idea of complexity, intertwining, contact and intersection of connected elements which, otherwise, would remain far from each other—separate.

In the mid-90s, in an article published by the italian newspaper *La Stampa*, we read that "the web is, above all, the freedom to travel, to invent a new itinerary each time, to meet the humanity behind every page of the Web"[2]. In this sense, the Internet can be understood as a *passe-partout* thanks to which, potentially, one can reach any place, favoring intercontinental connections, in a sort of "*return to Pangea*" of Rifkinian memory (Rifkin, 2011, p. 173); starting from these assumptions, the Indian geopolitical strategist Parag Khanna, in a volume of a few years ago (2016), spoke of *connectography* or a new cartography of the globe that provides increasingly mobile and malleable borders and interconnected spaces ("The world is really starting to look like the Internet" *cit.* Khanna, 2016, p. 41).

When we understand how much the geopolitical relations have fluidized through the mass media of the Net, we also realize to what extent they have transformed the subjective and collective logic of the human being. The separate spheres of individuals are also more fluid and versatile: we move in different environments, adapting to them from time to time, moving rapidly between virtual and physical dimensions, and interacting simultaneously with present or distant interlocutors. Thus we are witnessing *liquidity* of human experiences, to be intended not so much within the terms outlined by Bauman (2003; 2005), but as a new and profitable consistency of mental and relational mechanisms, a fluidity typical of the computerized world.

For several years now, the international scientific community has been investigating the repercussions that the Internet revolution has had in the area of training and knowledge sharing. The Web, as a complex system of data and information traveling at extreme speed, is a practically inexhaustible gateway to knowledge. Indeed, it could be said that the Internet is a *multiplier* of knowledge. However, from this enormous potential arises the need to regulate and secure the entire digital information apparatus.

Authier and Lévy (1992) realized 30 years ago that the ways of knowledge were multiplying suddenly, with a consequent devaluation of traditional qualifications and certifications ("*De tous les savoirs de la vie, seule une infime partie s'accompagne d'une reconnaissance par titres ou diplômes*» *cit.* Authier & Lévy, p. 89). According to this particular vision, the mass society of contemporaneity should be seen as a vast learning community (Wenger, 1998), characterized by the open sharing of knowledge and the equalization of all individuals. This is the idea of the "*arbres de connaissances*" formulated by the two authors, and put into practice in the *Trivium project.*[3] Promoting online training means offering training opportunities to everyone, even those who would

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[1] In De Mauro (2000), we read the following definition: "integrated system of interconnection between computers that allows the transmission of information worldwide", on the *internet, sv,* p. 1264.

[2] *La Stampa - Tuttoscienze,* October 18, 1995.

[3] Pierre Lévy (1956-) and Michel Authier (1949-) jointly founded the IT company *Trivium*, cradle of the *Gingo software*, through which it is possible to manage and co-build a network of *data exchanges* in the community.

normally be excluded from the *credentialing system*. Furthermore, the teaching material, when placed on the Net, becomes incredibly versatile; it can be transmitted live or sent to multiple recipients in different parts of the world, recorded, modulated and divided into packets, downloaded on various *devices*, paused, dubbed or played more than once at the speed you want.

In short, the 21st century saw an explosion of knowledge and a new way of transferring it, a situation comparable to the spread of movable type printing in the 15th century.[4] It is precisely in this framework that the system of *microcredentials*, the "micro-qualifications", is placed, with respect to which the most recent definitions will be provided below.

2. Background. Digital and microcredentials

Online education, through digital environments and resources, offers the global public formidable training opportunities, especially in higher education (*higher education*). According to the "open" perspective that online allows us to take, we must begin to completely re-evaluate the entire structure of the individual's education: the way of learning changes, the evaluation parameters change and the *curricula* are no longer static and monodisciplinary, but they are enriched and continually reworked according to the possibilities that are offered to the learner from time to time. New learning environments, digital and fluid, open the doors to the world of education (Limone, 2021): platforms of *MOOCs* and *open universities* set up extremely varied training courses with the issue of *ad hoc* certifications. They are designed to meet the training needs of large masses of students, making their own *open education available to them.* Resources are accessible 24 hours a day. *Massive Online Open Courses* (MOOCs) can be considered the flagship of *E-learning* and have had their exploit in the past decade. Some authors (Deng *et al.*, 2019) indicated it as one of the most significant technological innovations of recent years; these are courses that tend to be free and without access restrictions (Siemens, 2013), available on a large scale and provided by reliable institutions. MOOCs allow you to implement a skill, test yourself, and learn new skills. The prospects for growth, therefore, *multiply*, breaking any brake on the freedom of learning. For example, consider the following table, relating to the large number of free MOOCs offered by Coursera:[5]

Tab . 1 - Free MOOCs provided by the Coursera.org platform, last consultation: April 2022

DISCIPLINARY AREA	NUMBER OF COURSES AVAILABLE
Business	521
Social Sciences	310

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[4] Recognized as one of the greatest inventions in the history of culture and communication, movable type printing was first experimented in Europe by the goldsmith Johann Gutenberg (1394-1399), a native of Mainz. The first volume ever printed was the famous forty-two line Bible (1455). The innovative typographic technique gave a strong impulse to the circulation of knowledge, since the production of books became faster and cheaper; therefore the number of readers also increased, with a consequent flowering of lively circles and intellectual movements. In Italy, it was the Renaissance years.
[5] Coursera has a ten-year history, stemming from an idea by computer scientists Daphne Koller (1968-) and Andrew Ng (1976-). The platform, subject to a legal regime that regulates its duties and training requirements for users, currently has 82 million students connected from countless parts of the world.

Health	285
Physical Science and Engineering	236
Arts and Humanities	219
Computer Science	154
Data Science	106
Personal Development	66
Information Technology	62
Math and Logic	49
Language Learning	47
TOT.	2055

The versatility of MOOCs also lies in the various configurations (Rodriguez, 2013; Albó *et al.*, 2015; Bozkurt *et al.*, 2017), which they can hire:

- *xMOOCs* (where the letter "x" stands for "*extension / extended* "), based on the behaviorist approach, were distributed for the first time in the United States in the most avant-garde academic circles and consist of a classic teleconference, with *open materials* downloadable from the Web;

- The *cMOOCs* (where the letter "c" stands for "*connectivist*") place the learner at the center of the didactic experience, making him a producer of contents;

- The *bMOOCs* (where the letter "b" stands for "*blended*") are hybrid courses, for which the *face-to-face* (f2f) teaching activity is accompanied by MOOC contents usable in asynchronous and virtual mode.

The MOOCs can be manipulated according to the training demand, by intervening, for example, on the parameters of length—that is, *how* long the course lasts—and of capacity—that is, *how many* users can access it. Therefore, some interesting variants are obtained, called *NOOCs* (*Nano Open Online Courses*) or *SPOCs* (*Small Private Online Courses*), which can have the most disparate applications (Burge *et al.*, 2015; Rutkauskiene *et al.*, 2019; Ortega- Sánchez & Gómez-Trigueros, 2020).

These tools are indicative of completely innovative cultural and professional training, which can be "tailored" and conformed based on the priorities of the case. In this way, "mass" courses can be created, transferring essential contents; for example, the grammatical basis of a language, to as many people as possible. At the same time, extremely specialized courses can be created, aimed at a small circle of experts who need, for example, to learn a new technique or become familiar with a new instrument. This is certainly a useful and efficient mechanism, which is needed to give a just validation and certification recognized on a collective level.

From this, it follows that the student and the professional of the 21st century, during their training, come across a myriad of stimuli and possible crossings, intensifying their wealth of experiences thanks to *online education*. The individual himself is covered with a cloak of gaudy facets, to take up the metaphor of the

individual-Harlequin by Michel Serres (in Authier & Lévy, 1992), which represent his different skills and knowledge. Hence, the question of credentialing arises—modular and badging—the attribution of recognition to the *micro*-training carried out. However, especially when we talk about digital learning experiences and despite the recognized advantages of online in terms of access to information and materials (Yuhanna *et al.*, 2020), we tend to question their validity. In fact, there are many limits to be overcome concerning evaluation methods (Farrow *et al.*, 2021).

In US universities, for example, digital badges have long been considered a "*common currency*" for learning (Bowen & Thomas, 2014, p. 21). In practice, the badges visually symbolize the training goals achieved, small specializations or *skills* that the subject possesses and can "show off" in his own CV, but, above all, treasure in their collection of concrete abilities. In 2012, Purdue University (in the state of Indiana) launched an app called Passport (http://www.openpassport.org) that allowed students to manage their badges simply and immediately (Bowen & Thomas, 2014), officially consecrating the *badging* in the evaluation and advancement processes of university careers.

Passport allows you to draw up a digital and personalized portfolio in which to "pin" your badges, imitating the wood-badge of the specialties used in scout courses (BSA, 2010; Ellis *et al.*, 2016). Furthermore, the app is also a virtual workspace, through which it is possible to carry out quizzes, video assignments, and activities remotely and be evaluated according to a *rewards system.* In this way, teaching acquires motivating, engaging and interactive traits, as well as providing, in a certain sense, a visible manifestation of one's progress, in the form of badges. The *badging* mechanism fits perfectly into the logic of *microcredentialing*, that is, the breakdown of training courses into small certifiable units, which can be acquired mostly online or in hybrid mode. Some hugely successful companies, such as Cisco, Microsoft, or IBM, already use this system for the professional development of their employees (Borrelli & Tateo, 2021).

Expression of value and quality in military circles (Ellis *et al.*, 2016), *badges* also appear in the videogame world (Ostashewski & Reid, 2015), in their *digital version*, to symbolize achievements or *skills* acquired (see for example the "trophies" that can be collected in the game paths on PlayStation®5 and PlayStation®4). The growing popularity of *microcredentialing* requires an effort on the part of research to identify new forms of development and *best practices* applicable to the micro-qualifications system, with particular reference to their use in the *Self-regulated Learning* (SRL) methodology for training and professional updating (Gish-Lieberman *et al.*, 2021).

A systematic definition of the concept of microcredentials *is urgently needed*, starting from the very definition of the term (Oliver, 2021), currently absent, or in any case not unique. In the meantime, the potential of micro-qualification is attracting the attention of governments. In Oklahoma (USA), since 2017 there has been a *Task Force for the Future in Higher Education* coordinated at the state level that recently focused precisely on the development of *microcredentialing* (Griffith *et al.*, 2021); in September of last year, in Alberta, Canada, the Provincial Government allocated 5.6 million dollars to finance a project on *microcredentials* for advanced studies, to implement an up*skilling* initiative and promote youth employment (Wiseman, 2021); in the autumn of 2020, Ireland made 12 million available to set up a national *microcredentialing system* interuniversity over five years (IUA, 2020); in April of the same year, the Australian Federal Government subsidized some 20,000 training centers and institutes for the creation of nano-courses for the unemployed and trainees (Duffy, 2020). Also in Italy and in the rest of Europe, the issue of *microcredentials* did not go unnoticed.

3. Micro-qualifications in the Italian panorama

MOOCs providers are now a consolidated reality in Italy. The University of Naples Federico II presides over an *online learning platform* called *Federica*, which currently has about 350 MOOCs and about 500,000 users (https://www.federica.eu/). EduOpen (https://learn.eduopen.org/) is a project funded by the Ministry of Education, University and Research based on art. 11 of the Ministerial Decree of 4 November n. 815 (2014) and aimed at the creation and use of MOOCs.

The EduOpen partnership consists of a broad spectrum of university institutions:

- Polytechnic of Bari
- University of Bari "Aldo Moro"
- Free University of Bozen-Bolzano
- University of Camerino
- University of Catania
- Catholic University of Sacred Heart (Milan)
- University of Ferrara
- University of Foggia
- University of Genoa
- University of Rome LUMSA
- Marche Polytechnic University
- University of Milan-Bicocca
- University of Modena and Reggio Emilia
- University of Padua
- University of Parma
- University of Naples Parthenope
- University of Pavia
- University of Perugia
- University of Salento
- University of Salerno
- University of Venice Ca' Foscari

and other stakeholders:

- National Association of Former deported to Nazi Camps (ANED)
- Open Academy
- Democenter Foundation
- Jacques Delors Institute
- Department of Economics and Management (University of Pisa)
- Italian University Network for Lifelong Learning (RUIAP)

"*Make skills happen*" is the official motto of Bestr (https://bestr.it/), the first *digital credentialing* platform born in Italy, by the will of the Cineca consortium[6] (https://www.cineca.it/). The idea for Bestr originated from

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[6] Cineca is the leading inter-university consortium on the Italian scene. Founded in 1969, its mission was to contribute to the technological innovation of the country, dialoguing with universities, companies and research centers to favor the students, researchers, teachers and administrative-technicians who are part of its network.

the worrying reports on unemployment of young Europeans (McKinsey & Company, 2014), in which there was above all a disconnect between initial preparation *and* skills actually required in the workplace: less than 50% of employers were satisfied with the level of competence of their staff.

Tab . 2 - The survey includes respondents from different eurozone countries (Source: McKinsey 2013 E2E Europe youth survey)
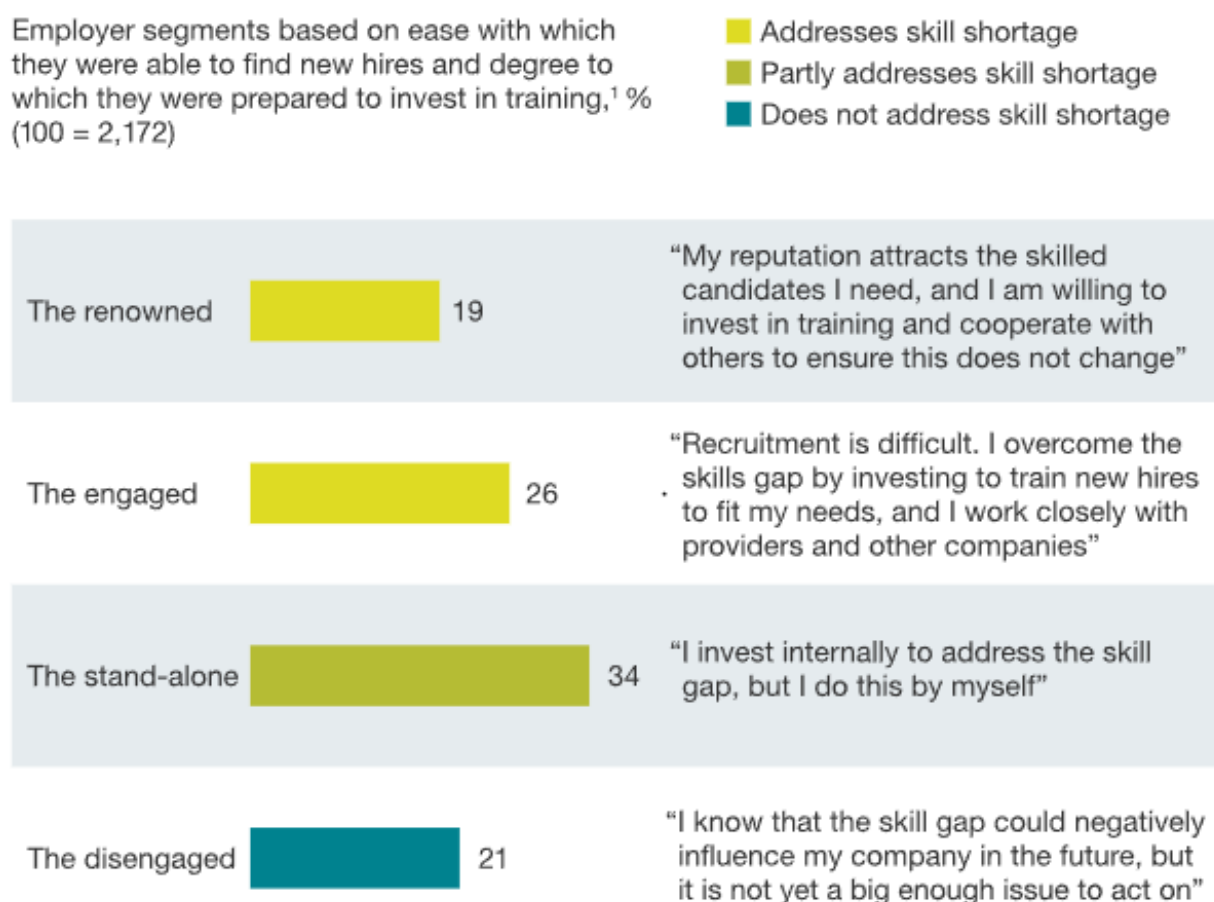
Bestr is a system that puts micro-qualifications in close relationship with the world of work. At the end of the course, a digital reference letter is issued which can be added directly to the *curriculum*. There are numerous badges currently available on Bestr. The presence of the academy is very strong:

Tab . 3 - Data on the partnership of Italian universities and polytechnics with the Bestr platform, the digital service credentialing designed by CINECA, last consultation: April 2022.

	UNIVERSITY BODY	NUMBER OF DESIGNED BADGES
1	University of Milan-Bicocca	323
2	University of Padua	267
3	Polytechnic of Milan	173

4	University of Venice Ca' Foscari	104
5	Bocconi University	103
6	University of Turin	92
7	University of Modena and Reggio Emilia	70
8	University of Verona	61
9	University of Siena	50
10	University of Foggia	36
11	University of Bergamo	32
12	University of Palermo	29
13	University of Basilicata	26
14	Sapienza University of Rome	26
15	University of Trento	23
16	E-Campus University	22
17	Free University of Bozen-Bolzano	21
18	University of Genoa	19
19	University of Parma	19
20	University of Ferrara	17
21	University of Insubria	17
22	University of Cagliari	15
23	Marche Polytechnic University	11
24	University of Macerata	9
25	University of Perugia	7
26	University of Brescia	7
27	Humanitas University	7
28	University of Milan	7
29	University of Trieste	4

30	University of Cassino and Southern Lazio	3
31	University of Sassari	2
32	University of Salento	2
33	University of Catania	2
34	University of Bari Aldo Moro	2
35	University of Rome LUMSA	1
36	Polytechnic of Turin	0
37	Polytechnic of Bari	0
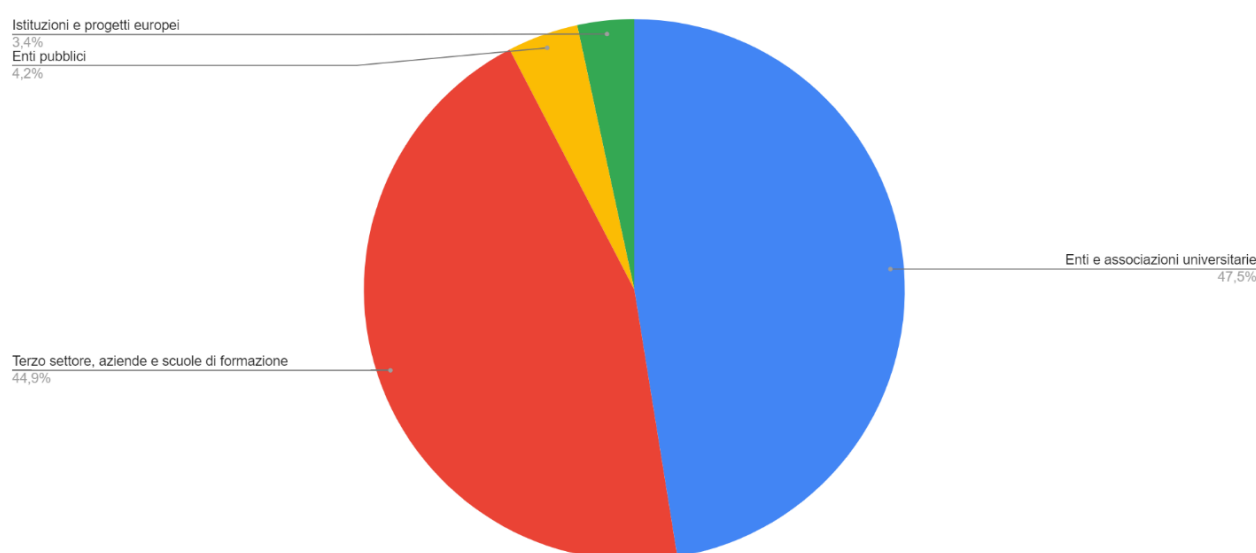
Graph . 1 - Organizations that release digital credentials through Bestr (yellow: public bodies; green: European institutions and projects; red: third sector, companies and training institutions; blue: universities and university associations), last accessed April 2022

The wave of *online learning* and micro-qualifications has driven the growth of numerous *websites* by *digital credentialing*, creating a prolific and competitive market, with a lively promotional activity through social media.[7]

The credentials released by Bestr are *open* and interoperable—in this case, we speak of *open badges.* The *open badge* is a device originally launched by the Mozilla Foundation in 2011 (Toto & Limone, 2019) under the name of OBI (*Open Badges Infrastructure*). The Open Badge standard (https://openbadges.org/) is the most widespread in the world and is recognized and shared by several organizations. A digital *open badge* is

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[7] For example, Corsi.it (https://www.corsi.it/) and Carriere.it (https://www.carriere.it/) are mentioned. Corsi.it issues certificates and recognized credits, which can be acquired after attending fully refundable paid courses. The subject areas are the most diverse, from marketing to copywriting, from video editing to HR management. Carriere.it, on the other hand, provides an annual subscription, with constantly updated online courses. The certifications obtained with Carriere.it issue ECP training credits (Continuing Professional Education), regulated by Law no. 4 of January 14, 2013.

represented by an image that contains, within it, a series of *metadata*; the latter can translate all the information concerning the competence acquired by the badge holder. Bestr represents a virtuous expression of *online education* and the University of the 21st century: innovative, open, interconnected.

4. Context analysis: Towards a regulation of microcredentialing in Europe

Specializations, *MasterTracks*, nano-degrees, and micro-masters are just some of the countless options of *microcredentials* provided by the most well-known *MOOC-providers*, such as Coursera, edX, or Udacity. The COVID-19 pandemic has given a significant boost to the proliferation of micro-qualifications; suffice it to say that, in 2020, 2,800 MOOCs were launched and 360 micro-qualifications established (Class Central, 2021). This exponential growth, followed by a *boom* in enrollment in online courses suggests two projections for the future: first of all, E-learning will be an increasingly used and cleared practice; secondly, it will be necessary to implement the methods of accreditation and recognition of the qualifications obtained. The value of the certification is a factor that must not be neglected at all since it has to do with the credibility not only of the user but also of those who issue the qualification (Toto & Limone, 2019). The evaluation processes of the micro-qualification, fundamental to making it recognizable and trustworthy, are however difficult to put into practice: given the vast distribution of users, the costs and times of the procedure expand considerably (Farrow *et al.*, 2021). For this reason, simple certificates of participation are often issued, which, however, may not satisfy the demand of the trainee. In general, there is a nebulous climate of uncertainty around the evaluation of micro-qualifications (Pollard & Vincent, 2022).

Europe has responded to the question by setting up the EMC (*European MOOC Consortium*), an observatory on *online learning* that aims to make its internal operations more transparent, fair, and effective (https://emc.eadtu.eu/), as well as to draw up specific projects on the subject and to establish networks between the European institutions that deal with training.

A recent state-of-the-art development by Farrow *et al.* (2021) is part of a project sponsored by EMC, *Labor Markets project* (EMC-LM), the first phase of which began in 2019–2021. The project partners (https://emc.eadtu.eu/emc-lm), framed in the Erasmus+ funding, include the major European *MOOC-providers* (Futurelearn, FUN, Miríadax, and EduOpen), some national agencies (ANPAL: Agenzia Nazionale Politiche Attive Lavoro; Ocapiat: Opérateur de compétences pour la Coopération agricole, l'Agriculture, la Pêche, l'Industrie Agroalimentaire et les Territoires; VDAB: Vlaamse Dienst voor Arbeidsbemiddeling en Beroepsopleiding) and some university institutes with particular research interests for *online education* (University of Foggia; The Open University UK).

An important *assessment tool* prepared by the *Consortium* is the *Common Micro—credential Framework* (CMF), responding to the pre-existing parameters of the EQF[8] established in 2008 (Trepulė *et al.,* 2021). The CMF is an excellent guidance tool made available to *learners* who intend to approach micro-qualifications. To be recognized within the CMF (EADTU-EU, 2019), the micro-qualifications must meet the following characteristics:

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[8] The European Qualifications Framework is a tool developed by the European Union to regulate the equivalence of qualifications and their comparability at international level. The EQF translates the desire to guarantee the free mobility of students and workers between the various member countries, in compliance with the constitutive ideals of the EU itself. The EQF is based on 8 levels of qualification, thanks to which each title can be equated with its cross-border counterparts; the levels, from 1 to 8, are set according to an increasing difficulty expressed by the title. National *frameworks* (NQFs) are coordinated with and linked to the EQF, so that the various local titles can be "interpreted" at the international level. Currently, all Member States participate in the EQF; another 11 countries are taking steps to join the Framework (Iceland, Liechtenstein, Norway, Switzerland, Albania, North Macedonia, Montenegro, Serbia, Turkey).

- Correspondence to a minimum of 100 and a maximum of 150 hours of overall activity, also including the evaluation processes, which can be cumulative;
- Correspondence to levels 6 or 7 of the *European Qualification Framework* (EQF) or equivalent levels of national QFs;
- Compatibility with academic credits, using a cumulative assessment system that provides for the achievement of the micro-qualification or prior enrollment in a university course;
- Availability of a valid identifiable ID system at the platforms and entities that adhere to the CMF;
- Availability of a *transcript* establishes the learning objectives expected from the micro-qualification, the total hours of study required, the EQF level and the corresponding number of credits.

A fundamental element of the actions undertaken by Europe to stabilize the phenomenon of *microcredentialing* is the MICROBOL project (*Microcredentials linked to the Bologna Key Commitments*). Community governance has always insisted on the importance of the transferability of knowledge and skills within the European area, setting up, for example, the credit transfer and accumulation system (ECTS), on which the exchange mechanisms of the Erasmus program are based (*European Community Action Scheme for the Mobility of University Students*).

In the wake of the Bologna Process,[9] MICROBOL, with its 34 recommendations, aims to: explore the potential of *microcredentialing*, promote the development of micro-qualifications by involving the best partners, raise awareness levels regarding *microcredentialing*, create a common framework recognition, adapt legislative bodies to new needs, encourage the digitalization of training courses (MICROBOL, 2021). Last December 2021, the European Union issued a recommendation (European Commission, 2021) on the future approach of Member States concerning *microcredentials*, continuing the intentions set out by the *European Skills Agenda* of July 2020. The objectives of the proposal consist of:

- Enable European citizens to acquire new knowledge, *skills,* and competencies;
- Support the effectiveness of *microcredentials providers* in ensuring flexible and personalized learning;
- Promoting inclusion and equal opportunities.

To achieve these goals, the EU intends to involve Member States, stakeholders and *providers* in a multisectoral and international perspective. The Commission, over a two-year period 2020–2021, collected the opinions of the stakeholders, interviewing 43 countries and collecting over 500 contributions. Feedback from stakeholders was generally positive. The theoretical background of the proposal included several reports and studies concerning *upskilling* and *reskilling*, considering data from different observatories (OECD, CEDEFOP, ETF, NESET) and different Erasmus+ experiences.

With its recommendation, the EU encourages member states to use *microcredentials* in reaching 60% of adult citizens in training per year, as prescribed by *the Action Plan of the European Pillar of Social Rights*. The recommendation also establishes a universal definition of *microcredentials* (see *below, Graph*. *2*) that Member States are encouraged to adopt, together with the descriptive parameters of the micro-qualification, namely:

- identification of the learner;

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[9] The "Bologna Process" refers to an intergovernmental agreement signed in Bologna in 1999, originally conceived by the Ministers of Education of France, Germany, the United Kingdom, and Italy. Since 2010, starting from the focal points of the Bologna Process, a European Higher Education Area has been established, whose objectives are: to guarantee the academic freedom of citizens, to include teachers and students in higher education governance processes, to encourage the international mobility of teachers and students, promoting employability and lifelong learning of graduates, fostering relations with extra-European higher education; in the area of qualifications and qualifications, the Bologna Process partners have implemented reforms aimed at: introducing a system of interoperable and comparable qualifications, introducing a single *credentialing system* based on workload and *learning outcomes*, and implementing quality assurance, ensuring the recognition of qualifications and periods of study.

- title of the micro-qualification;
- Country/region of the provider*;*
- aspect of certification;
- release date;
- learning goals;
- teaching load, expressed in ECTS where possible;
- EQF level, where applicable;
- evaluation method;
- form of participation in teaching activities;
- quality methodology assurance (QA) adopted.

The document also encourages the creation of an ecosystem for *microcredentials*, within which Member States undertake to support higher education in the development of micro-qualifications and oversee accreditation processes in formal and informal contexts. Finally, Member States are invited to include microcredentials in education and labor or economic development policies, drawing on the funds indicated in the document (RFF, REACT-EU, Erasmus+, Horizon, etc.).
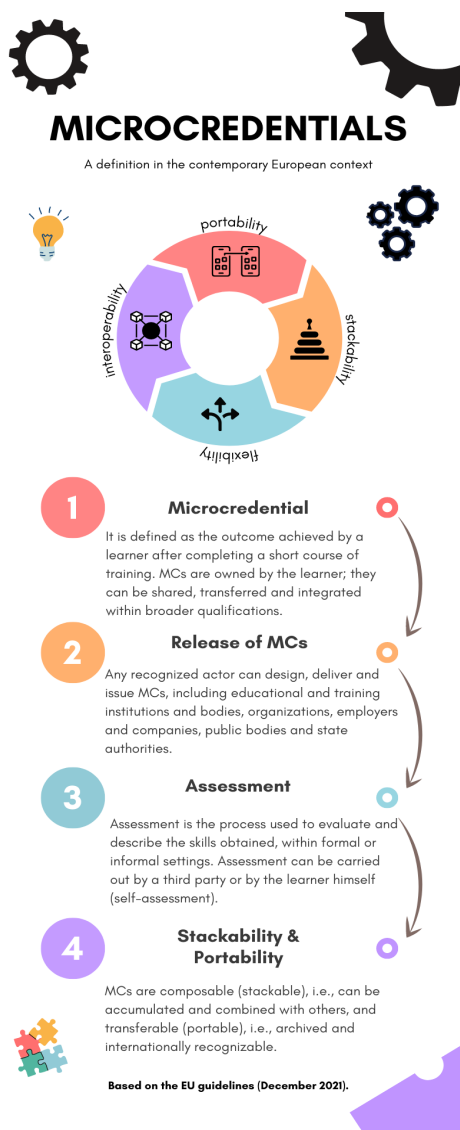
Graph . 2 - Definition of microcredentials , with reference to the EU Recommendation of December 2021

5. Conclusions

From the latest Horizon report (Pelletier *et al.*, 2021), relevant elements emerge to trace the current state of *microcredentialing* in the world. First of all, substantial growth in investments in the micro-qualifications sector is expected in the five-year period between 2021–2026 (Holon IQ, 2021) to the benefit of the sectors dealing with training and teaching. Also considering the latest European provisions (see above), the nature of micro-qualifications allows them to be used and issued even within non-formal and informal contexts, as well as in large companies. The latter can potentially become competitors of institutions traditionally delegated to training, colleges, universities, and academies. Google has recently announced the birth of *Google Certificate*, a title that represents skills in the field of *project management* and data analysis (https://careers.google.com/).
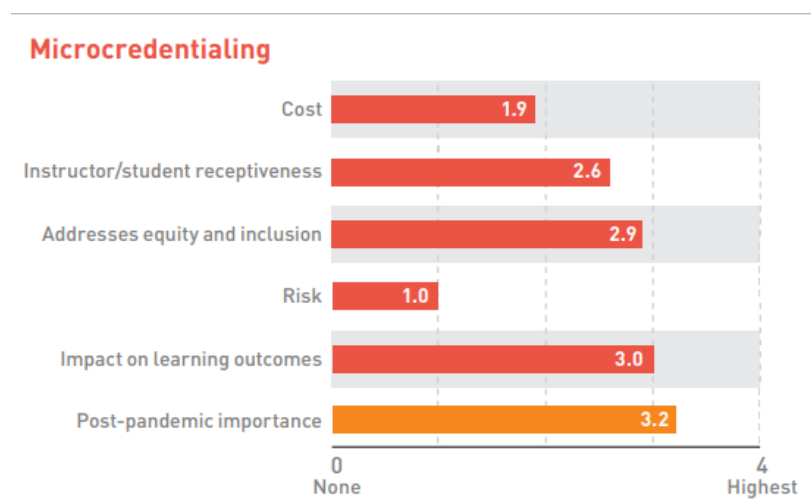
Graph . 3 - Some market statistics on the current state of microcredentialing (Source: Pelletier et al., 2021)

The winds of change bring with them *micro systems*, but harbingers of macro-transformations. Many institutions will have to respond to new trends by re-adapting educational programs and assessment systems. IMS Global[10] is collaborating with various institutions and partners to develop a new tool to record individual training progress and validate micro-competences, the *Comprehensive Learner Records* (CLR). The CLR can be considered as an *upgrade* of the previous *e-portfolio* (Lorenzo, 2022), with the advantage of greater interoperability. The CLR can include in itself the digital portfolio, can be managed and privatized by its owner, capitalized through platforms that support the blockchain, and shared with potential employers or institutions. Some Japanese universities and suppliers of *digital badges*, under the pressure of the IBM *Japan Society*, have adopted the framework in common IMS *Open Badge 2.0*, issuing internationally recognized digital micro-qualifications and placing them in the labor market. American universities are also devoting much attention to the issue. The University of Madison (Wisconsin) has launched the CORE (*Curriculum Organization Revision and Evaluation*) project, to create flexible and transformative training courses, equipped with cumulative micro-qualifications and modular, in line with professional goals; California College of the Arts launched an

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[10] The IMS global consortium is a non-profit organization that intends to harness technology to increase levels of global participation in educational processes. IMS is a network of institutions and stakeholders that is committed to making education as accessible and open as possible, promoting innovation, qualification interoperability, and process transparency.

online micro-training program targeting the *Learning Resource Center* (LRC), a student *mentoring* younger colleagues; Texas A&M University has launched on the Web a series of open, free, game-*based micro-courses* tailored to the specific needs of students. The growing interest of research in *microcredentialing* (Wolz *et al.*, 2021; McGreal & Olcott, 2022) has produced interesting reflections on possible developments and applications of this system in the world of education. Micro-qualifications represent an opportunity for professional *training* and updating. For example, for those working in the field of education. Cera (2021) proposed a model that uses MCs to educate trainee teachers about sustainable entrepreneurship and transdisciplinary skills; Burrows et al. (2022) also looked at teacher training, noting that *microcredentialing* can increase the levels of self-efficacy perceived by teachers with respect to the use of computers and cybersecurity. However, micro-qualifications can also be used in the training of other professional figures, such as law enforcement agencies (Del Toro, 2021). *Microcredentials* are intended as a powerful device that is full of possibilities. As with any other innovative tool, its very high potential can convey a sense of instability and uncertainty, precisely because it is developing and settling. New online resources are needed to provide an overview of individual micro-qualifications, a sort of map that organizes and links them together (Gutierrez & Martin, 2021). We also need to understand how to integrate *microcredentials* with pre-existing devices, such as the electronic portfolio and the *open badge.* Furthermore, an in-depth and co-conducted study by Italian universities is needed on the available means and tools for *microcredentialing* that can be used, such as the ESSE3 service platform provided by CINECA, in order to carry out *policies* nationwide, which are in line with the latest global trends. Finally, there is still a lot to do with regard to *assessment methods* of micro-qualifications and *digital credentials* in general, although new solutions are emerging (Farrow *et al.*, 2021). A possible perspective is the one that sees the combination of *gamification* and *game-based learning* to *self-assessment procedures*. In any case, there are many traceable lines of research, in a reality as explosive and lively as that of micro-qualifications, which brings with it extensive measures, debates, and question marks of global proportions. We just have to ask ourselves: are we perhaps at the gates of an *MC-revolution*?

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Design, development and evaluation of a short distance learning program on the recording of monuments and cultural heritage sites

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Abstract

This paper pertains to the design, assessment, and evaluation of the short postgraduate program "Recording of monuments and cultural heritage sites: Contemporary methods and technologies" offered by the School of Applied Arts and Sustainable Design of the Hellenic Open University (HOU), since 2021. The program is implemented online via distance learning and aims at meeting the high demand for specialized training in the field of monument recording and documentation of cultural heritage in Greece with the use of contemporary technologies. It is structured in such a way as to cover a wide range of subjects, taking into account a diverse background of students. Total duration is 16 weeks and corresponds to 250 hours of training. Throughout the program the students have the opportunity to contact the tutors for support of their study and work. For the assessment of the program (2 completed cycles), an already used and tested evaluation method with a targeted questionnaire was chosen. The aim was to capture the students' point of view on the organization of the program, the curriculum, and the method of teaching, so that it can be used for the evaluation and optimization of the program. The answers to the questionnaire show that the students were very satisfied with the program and evaluated it positively (Avg. grade> 4 out of 5).

Keywords: education, short program, cultural heritage, digitalisation, recording.

1. Introduction

The term "cultural heritage" includes a set of material and immaterial values and objects that constitute the beliefs, activities, and achievements of specific historical and social groups of humanity. Monuments refer to artefacts with a clear material existence, classified either as immovable (buildings, temples, archaeological sites) or movable (works of art, archaeological findings, etc.) but also intangible cultural goods (myths, customs, oral traditions, dances, events, music, songs, skills, or techniques, etc.).

The systematic recording, protection, promotion and highlighting of the elements of cultural heritage is a universal social need comparable - by analogy - to the need of any individual to take care of, display and preserve the special elements that constitute his/her individual identity.

According to the European Parliament's Eurobarometer survey in 2017 (Eurobarometer 2017), at least 8 out of 10 respondents believe that cultural heritage is not only important to them personally, but also to their community, region, country and the European Union (EU) as a whole. A large majority feel pride for cultural heritage, whether it refers to their own region or country, or in another EU country. More than 7 out of 10 respondents also agree that cultural heritage can improve their quality of life. The survey also shows that 9 out of 10 believe that cultural heritage should be taught in schools as it is an efficient and important way to learn about history and culture. Three-quarters believe that EU countries and the EU should allocate more resources to protecting Europe's cultural heritage.

Indeed, the preservation of cultural heritage is essential for the spiritual and mental balance, quality of life and cultural identity of people in the present and of future generations. For these reasons, international UNESCO [unesco.org], Council of Europe, [coe.int] ICOMOS [icomos.org], ICOM [icom.museum] ICRROM [iccrom.org] and national bodies (indicatively in Greece the Hellenic Ministry of Culture and Sports [culture.gov.gr]) have been established with their scope being the protection and promotion of cultural heritage. Moreover, special legislative framework (International Conventions, Charters, Declarations and Recommendations as well as national legislation) has been put into force for its systematic recording, preservation and protection.

The new Short Distance Learning Program "Recording of monuments and cultural heritage ensembles: Modern methods and technologies" https://www.eap.gr/education/short-programs/apotyposeis-mnimeiwn-kai-sinolwn-politistikis-klironomias-sygxronoi-methodoi-kai-texnologies/ of the Hellenic Open University (HOU), attempts to provide knowledge for the recording of cultural heritage in an organized methodical and scientific way, at the postgraduate level. The program aims, on one hand, at an in-depth understanding of the concept of cultural heritage and on the other hand, in offering the necessary know-how for mapping, recording and geometric documentation of immovable monuments. Specifically, it attempts to meet the demand for specialized training in the field of monument recording and antiquities documentation with contemporary technologies. Recent research, within the framework of the European DELTA program, in which HOU also participates (Delta Report, 2020), demonstrated the absence of teaching of several specialized subjects in the respective study programs of Greek Universities. At the same time, students of all levels, academics, as well as professionals in the field emphasize the need to learn specialized knowledge subjects, as these are essential tools and skills for the successful execution of archaeological research, projects and tasks related to the protection of cultural heritage. The program is implemented using the distance teaching method, platform and structure based on the methodologies developed and evolved by the HOU since its establishment until today (Lionarakis, 2010; Lionarakis, et al., 2021).

The quality and, by extension, the success of an educational program is a multidimensional concept determined by clearly defined standards and specifications, which impose its evaluation, according to specifications derived from science and research. (Kokkos, 2005; Spanaka, and Theodosiou 2013). Although evaluation involves inherent objectivity difficulties, it is a useful and practical tool for planning and improving a program (Spanaka, 2021). For the evaluation of the specific program, the evaluation method with the use of a targeted questionnaire was chosen, as this method was successfully tested by other HOU programs (Zisimou and Reppa, 2015). The aim of the evaluation was to capture the students' point of view on the organization of the program, the teaching material and the teaching method, so that it can be used for the optimization of the

program in future cycles. In the following sections, the structure of the program, the questionnaire and the evaluation of the answers are presented in detail. The evaluation quantified by statistical terms and the results are provided within tables. Based on this data, actions are planned to further improve the effectiveness and quality of the program in relation to the set goals.

2. The program "Recording of monuments and cultural heritage ensembles: Modern methods and technologies"

The program was structured in such a way as to cover a wide range of subjects taking into account the diverse scientific background of the students. It was decided that a multidisciplinary approach, would provide the necessary knowledge and basic skillset that any discipline, within the cultural heritage preservation, needs. In this way, students taking part in the program were not limited by their first degree. A vast array of differing disciplines was selected that provided the multidisciplinary student cast necessary to fulfill the scopes of the program.

The program modules provide basic knowledge on the theoretical approach for the documentation of monuments, with an emphasis on geometric documentation and recording, the description of the content of the recording and the presentation of modern methods and technologies for their recording and analysis. The techniques for recording and mapping archaeological sites and monuments are examined, as well as the methods for interpreting and analyzing the data and presenting the results. Examples of applications and videos are used to demonstrate how to use and operate the methods and systems. The division of the learning objects into five thematic sections was made with the aim of transmitting interdisciplinary knowledge in the field of the use of digital tools of three-dimensional modeling, photogrammetry and G.I.S. Table 1 shows a brief description of the program Course Modules:

Table 1. Program Structure

Description of Module	Hours
1st Module: Cultural Heritage 1.1 Introduction to cultural heritage. Description of key concepts. 1.2 Organizations that undertake initiatives at international and national level. UNESCO activities. Protection of cultural heritage at international and national level. International conventions, authoritative texts (e.g., Venice Charter) and national legislation 1.4 Milestones in the History of Greek Architecture. 1.5 Top monuments and monumental complexes of Greece. 1.6 Definition of the concept of monuments and the relevant categories. Introduction to the concepts of documentation, registration, management, and digitization of cultural heritage.	50
2nd Module: Introduction to 3D design 2.1 The 3D design interface 2.2 Creating 3D objects 2.3 3D object processing – object transformations	30

2.4 Projection Systems – Virtual Camera	
2.5 Virtual representation algorithms	
3rd Module: Recording methods 3.1 Geometric documentation of monuments. Description of the process of data acquisition, processing, and presentation of the monument's characteristics. 3.2 Conventional Methods. Introduction to surveying and photogrammetry 3.3 Topometric surveying method, description, and application with examples. 3.4 Topographic mapping method. Surveying instruments and plans. Determination of shape, size, and position of the monument in three-dimensional space.	50
4th Module: Photogrammetric method 4.1 Definition of photogrammetry, description of photogrammetric instruments, digital photogrammetric station. 4.2 Information collection, digital image, and image processing. 4.3 Orientations, photostable measurements, aerial triangulation applications. 4.4 Terrestrial Laser Scanning, Structure From Motion. 4.5 Development of a Structural Information Model for historic structures. (Historic Building Information Modeling, HBIM) 4.6 Export of 3D model, production of orthophoto mosaics.	50
5th Module: Geographic Information Systems (GIS) for the management of monuments 5.1 Introduction to Geographic Information Systems (GIS). Description of basic concepts for spatial analysis. 5.2 Database creation, data entry. 5.3 Basic spatial operations for data analysis. 5.4 Modeling and visualization of monument data in a GIS environment. 5.5 Production of monument performance maps using GIS.	40
6th Module: Written Assignment Final thesis in all subjects of the above modules.	30
Total	**250**

The above modules introduce students to the basic concepts related to monuments and offer basic knowledge and skills, from the assessment and characterization of a cultural heritage monument as such, to the production of an integrated 3D textured model. Each student class contains a maximum number of 30 per class, so as to provide a reasonable student/teacher ratio for quality assurance. The total duration of the program is 16 weeks and corresponds to 250 hours of training. Specifically:

- 240 teaching hours are carried out with asynchronous distance learning and concern on the one hand the study of educational material, the preparation of learning activities and tasks and on the other hand the study for the final work.
- 10 teaching hours are carried out by teleconferencing distance learning (5 sessions of 2 hours each).

The education model is of a mixed type (blended learning) and is based on a combination of synchronous and asynchronous distance learning (Kokkos et al. 1998; Keegan 2001). Throughout the program, the trainees have the possibility to communicate with the instructors to support their work and study. Upon completion of the program, graduates should have developed the skills required to delve into the field of mapping and geometric documentation of monuments and sites. More specifically, after completing the program the trainees are able to:

- have theoretical knowledge about the types of cultural heritage and the importance of recording and protecting them.
- understand the ways of recording and managing cultural heritage.
- recognize when and why a building or a complex is considered cultural heritage.
- possess the theoretical background for the methods of capturing buildings and sites.
- choose appropriate tools and methods for capturing monuments.
- manage topographic and photogrammetric surveying software and files.
- recognize the procedures for managing geographic information systems databases.

2.1 Cultural Heritage

The first module titled "Cultural Heritage", with a duration of three weeks, briefly covers the theoretical aspects of cultural heritage, its protection, conservation, and management at international and national level. It includes a brief historical review and an overview of the theoretical framework and approaches to the protection, management, and interpretation of architectural heritage (Mallouchou-Tufano 2016). The module is divided into two sections. The first section, lasting one week, focuses on the concepts related to cultural heritage, the basic terminology of monument protection, as well as the existing international and national framework of their protection. It contains three distinct subjects of study:

1.1: The concept of cultural heritage and monuments. It comprises its categorization, according to International Organizations.

1.2: Includes the basic terminology corresponding to the different types of interventions: conservation, stabilization, restoration, anastylosis, protection, integrated protection, cultural heritage management etc.

1.3: Presents the framework for the protection of monuments in a international and national level: a) International and national protection bodies, b) International Texts of Principles for Cultural Heritage. Expected Learning Outcomes from the first module are:

- Understanding of the (contemporary) concept of monument, cultural good, the concept of cultural heritage and its categorization, according to International Organizations.
- Understanding the basic terminology corresponding to the different types of interventions in monuments.
- Knowledge of the main international and national bodies for the protection of cultural heritage.
- Understanding the importance of recording and documenting cultural heritage.

The second section, lasting two weeks, focuses on the architectural heritage, on the ways of recording, documenting, studying and finally protecting it, through the internationally recognized theoretical principles of interventions in monumental structures. It is divided into two sections:

2.1: A brief introduction to the scientific field of the History of Architecture is attempted by briefly covering the following issues a) Beginnings and historical development, b) the study of the History of Architecture today, c) the Analysis Methodology and d) Factors affecting architecture.

2.2: An introduction to the theoretical principles of protection and interventions in monuments. Briefly covered a) the beginnings of monument protection and b) the theoretical Principles of monument protection and interventions in Greece and Internationally. Expected Results of the second module are:

- Understanding how to study the History of Architecture.
- Establishing the importance of recording and documenting cultural heritage.
- Familiarity with the main trends of architectural restoration with particular emphasis on the 19th and 20th centuries, up to the most modern approaches to the subject, through Conventions, Charters and other texts of international organizations.
- Understanding of the theoretical principles of intervention in monuments in Greece and internationally.

2.2 Introduction to 3D Design Page format

The second module is a two-week course on the "Introduction to 3D Design" that introduces the processes of 3D computer aided design by describing the respective theories about 3D digital space and the creation of objects. It is divided into two individual sections.

The first section, lasting one week, analyzes the properties of 3D models and the space in which they are located. It concludes with the presentation of the ways of processing 3D objects. It is divided into two separate subjects of study:

1.1: Presents the basic terms encountered in 3D design as well as the various categories into which 3D objects are divided (shapes, surfaces, polygonal objects, etc.).
1.2: Discusses the rules for processing and transforming 3D objects.
Expected Learning Outcomes from the first section are:

- Knowledge of the basic elements that constitute a 3D model and analysis of the properties of the 3D space in which the model is located.
- Knowledge of the basic categories of objects in three-dimensional space.
- Understanding how to design shapes and create 3D objects.
- Familiarity with the properties of changing the shape of polygonal objects through the points of which they are composed as well as understanding the operation of parametric transformations in three-dimensional objects.

The second section, lasting one week, presents the projection systems in a 3D environment, describes the characteristics of the virtual camera and analyzes the properties of digital materials (Zerefos, 2013). It is divided into two sections:

2.1: Projection systems are analyzed (Orthographic, axonometric and perspective projection systems), as well as some basic concepts for handling the virtual camera (lens, cone of view, exposure to light, etc.).
2.2: The properties of digital materials are introduced and the ways of placing them in 3D objects are presented. Expected Results of the second section are:

- Understanding of the three basic projection systems in 3D space.
- Incorporating the different parameters of a virtual camera and how to position it in relation to space and light.

- Understanding when a digital material is textured and when it is not and knowledge of creating texture in digital materials.
- Knowledge of how to position digital materials and align their texture to 3D objects.

2.3 Recording Methods

The module "Recording methods", lasting three weeks, introduces the geometric documentation of monuments. Conventional topographic methods are presented, especially the surveying method. It is divided into three sections: The first week-long section introduces the concept of geometric documentation of a monument in three-dimensional space, and analyzes the definition of recording as well as the different categories of recording. It describes the following surveying methods: the topometric, the topographic and the digital methods which are: a) the passive method, that uses scanning of the object using photography and is called digital photogrammetry and b) the active method which is scanning the object using a laser scanner. The instruments used for each method are presented and the results of the different methods are explained through examples. Expected Learning Outcomes from the first section are:

- Understanding the basic concept of recording a monument, the different categories of imprinting and its content.
- Understanding the importance of different scales and using the appropriate scale to capture the monuments according to his needs.
- Understanding of the basic methods of recording monuments and sets of cultural heritage.
- Explanation of the method of photogrammetry and the Laser Scanner.

The second section, lasting one week, presents the topographic method. The process of creating a 3D model of the object based on the 3D Cartesian coordinates derived from measurements in the field, in the physical space of the object, is presented. Expected Learning Outcomes from the second module are:

- Explaining the method of surveying, understanding the data in space and explaining the fundamental problems of surveying.
- Understanding of horizontal, vertical and tacheometric recording.
- Incorporating the construction of a topographical diagram of the ground plan of an archaeological site with its basic characteristics.
- The third week-long module presents finding the elevations of the object's points of interest. Also presented is the concept of tacheometry with its final result, which is the finding of three-dimensional coordinates. Here is the explanation of finding the area of simple and complex shapes.
- Expected Learning Outcomes from the third module are:
- Understanding the process of finding elevations with two different methodologies, geometric leveling and trigonometric leveling. Clarification of the different surveying equipment for the two methodologies.
- Understanding of tacheometric or topographic surveying, where 3D coordinates for the object are extracted.
- Knowledge of the different ways of finding areas for simple and complex shapes.

2.4 Photogrammetric method

The module "Photogrammetric method", lasting three weeks, presents the photogrammetric method for recording the monuments. The basic concepts and uses of photogrammetry for the restoration and documentation of monuments are described. It is divided into three sections:

The first week-long section introduces the basic concepts of the photogrammetric process and the differences between a map and a photograph. Analyses the operation and explanation of the camera model, different types of cameras, photogrammetric products and photogrammetric equipment. Expected Learning Outcomes from the first module are:

- Understanding of the photogrammetric method as a basic method for the recording of monuments.
- Incorporating the photogrammetric process from the acquisition of data through photographs to the construction of a 3D model of the object.
- Knowledge of the concept of photography scale.

The second section, lasting one week, presents the photogrammetric orientations with their separation for one and more photos. The coordinate systems, their correlation and their implementation are presented. The concept of beam through several photographs, as well as the structure from motion technique are described through examples. Expected Learning Outcomes from the second section are:

- Explanation of the concept of photogrammetric orientations. Analysis of the different coordinate systems and the process of extracting 3D information from the photo pair.
- Understanding the concept and use of multi-image photogrammetry. The concept of beam and structure from motion are introduced.

The third section, lasting one week, presents digital image processing and its application to the photogrammetric process. The most important techniques for image enhancement and the extraction of 3D geometric information are presented theoretically but also through examples. Description of the scanning of monuments with a Laser Scanner and presentation of the Historic Building Information Modeling methodology. Expected Learning Outcomes from the third module are:

- Understanding of the process of digital image processing and its algorithms.
- Knowledge of the coordinate system of the digital image.

2.5 Geographic Information Systems (GIS) for the management of monuments

The Module "Geographic Information Systems (GIS) for the management of monuments", lasting two weeks, presents Geographical Information Systems and their use in monuments and cultural heritage sites. It is divided into two sections:

The first section, lasting one week, presents the basic concepts of the Earth's Geographical Information System and its most important features. The different methods of data entry, spatial data management, georeferencing, the concept of spatial database and visualization of results are described. The different coordinate systems, the physical and mathematical model of the earth and map projections are analyzed. Spatial data formats, vector and mosaic, are analyzed. Expected Learning Outcomes from the first section are:

- Understanding of the basic concepts of a Geographical Information System for data entry, management, analysis and visualization.
- Embedding the concept of georeferencing and reference systems.
- Knowledge of the concept of projection and reference surface for map production, the concept of Geodetic Datum, the Greek geodetic reference system and the map production process.
- Understanding of different data formats, their advantages and disadvantages.
- Knowledge of digital databases and understanding of the two main categories of the flat file base and the relational base.

The second, week-long section, introduces spatial data analysis and the different types of questions. The Structured Query Language is described theoretically and with examples and basic terms of the specific language for the processing of spatial objects are analyzed. Various types of spatial queries based on different criteria are presented. Statistical data analysis and spatial analysis based on other methodologies are described. The thematic and topographical maps as well as the online ones are analyzed. Expected Learning Outcomes from the second module are:

- Knowledge of spatial analysis, exploratory data analysis using the Structured Query Language, spatial queries and spatial object distance queries.

- Understanding the concept of map, topographical and thematic maps and thematic map techniques. Embedding the concept of the web map.

3. The Questionnaire for the evaluation of the program

The evaluation of the program was carried out using a questionnaire which was given to the trainees near the end of the program. The questionnaire, which covers all five course modules, is divided into five axes mostly using a Likert scale of 1-5:

1. Evaluation of the tutors in terms of communication, divided into eleven (11) questions for each module.
2. Evaluation of the tutors regarding the feedback/grading of the written assignments, divided into three (3) questions for each module.
3. Evaluation of the educational material, divided into eleven (11) questions for each module.
4. Evaluation of the organization of each module., divided into eleven (11) questions for each module.
5. Evaluation of the administrative and technical services of the HOU, divided into six (6) questions.

In addition, for statistical reasons, there were four (4) general questions concerning the individual characteristics of the trainees. The questionnaire with its possible answers is listed in Table 2.

Table 2. The Evaluation Questionnaire

Evaluation of the Short program - Design, development and evaluation of a short distance learning program on recording of monuments and cultural heritage sites	
Question:	**Response type:**
Choose your educational level:	University Degree, Masters, PhD.
Name the your graduation year (1st degree):	Free text (Short)
Which is your professional activity?	Private sector, public employee, Freelancer, Other
By completing the short program, would you be interested further with this subject?	No, I am not interested / Yes, in a master's degree/ Yes, in a PhD/ Yes, at the level of practical application
1. EVALUATION OF THE TUTORS AS TO COMMUNICATION.	
1.1. Evaluate the effectiveness of communication with your tutor (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
1.2. Evaluate the tutor's effort to stimulate your interest in the subject of the module (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory

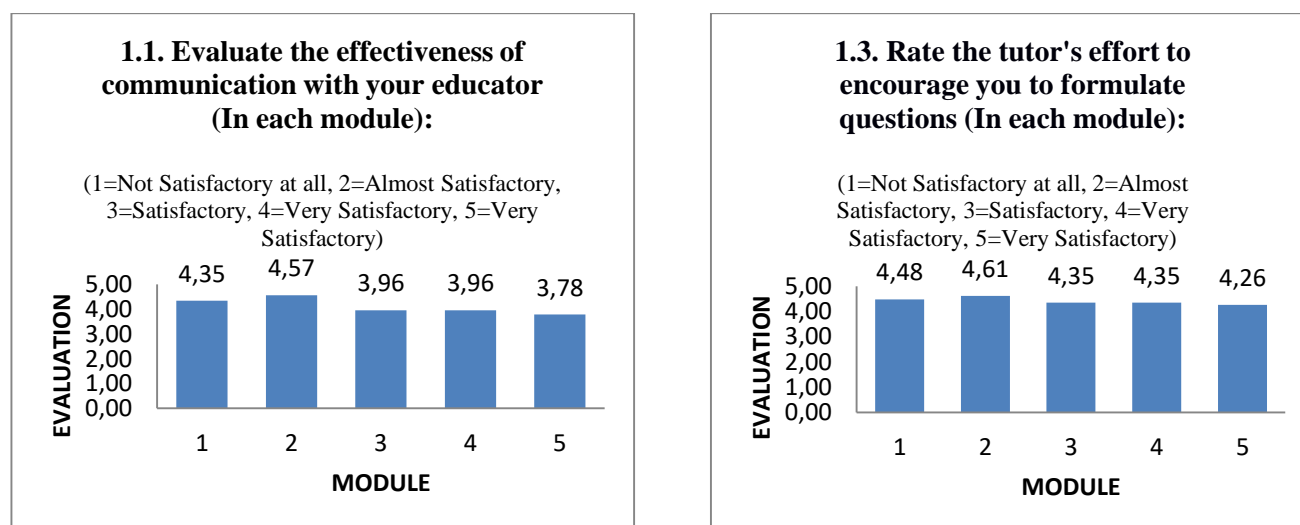|	
1.3. Rate the tutor's effort to encourage you to formulate questions (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
1.4 Rate the effectiveness of the tutor in solving your questions (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
1.5. Rate your tutor's effort to present the concepts in a simple way using examples (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
1.6. Mention the most important positive elements that, in your opinion, the communication with your tutors had (Mention the number of the module to which you refer in each of your comments):	Free text (short)
1.7. Mention the most important negative elements that, in your opinion, the communication with your tutors had (Mention the number of the module you refer to in each of your comments):	Free text (short)
1.8. How many meetings did you attend? (In each module):	0, 1, 2
1.9. Evaluate the organization of the presentation of the material during the meetings (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
1.10. Evaluate the contribution of the meetings to the understanding of the content of module (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
1.11. Evaluate the way in which the tutor managed the tensions that may have arisen during the meetings (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
2. EVALUATION OF THE TUTOR AS REGARDS FEEDBACK/GRADING OF WRITTEN ASSIGNMENTS.	
2.1. How many tasks/activities have you submitted in this Module (In each module):	0, 1, 2, 3, 4
2.2 Evaluate the time response of your tutor in correcting assignments (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
2.3 Rate how constructive your tutor's feedback was on your written assignments (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
3. EVALUATION OF THE EDUCATIONAL MATERIAL	
3.1. Rate the contribution of the learning materials to supporting your studies within this short Program:	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
3.2. Rate whether this short program meets your expectations:	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
3.3. Evaluate the material covered in terms of its organization:	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory

3.4. Rate how understandable you found the training material:	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
3.5. Evaluate the extent of the educational material (In each module):	1=Too little material, 2=Little material, 3=Satisfactory, 4=Large material, 5=Very large material
3.6. Mention the most important positive elements that the educational material had in your opinion (Indicate the number of the module you refer to in each of your comments):	Free text (long)
3.7. Mention the most important negative elements that, in your opinion, the educational material had (Indicate the number of the module you refer to in each of your comments):	Free text (long)
3.8. Mention useful improvements you would like to see made to the training material:	Free text (long)
3.9. Rate how interesting you found the specific educational material (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
3.10. Evaluate the contribution of the specific educational material to the understanding of the cognitive subject of THE (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
3.11. Evaluate the contribution of the specific educational material to the preparation of the corresponding written assignments (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
4. EVALUATION OF THE MODULE'S STRUCTURE	
4.1. Rate how clear the objectives of module were (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
4.2. Rate how easy it was to follow the suggested study schedule of module (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
4.3. Evaluate the contribution of the assignments to the overall understanding of the module (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
4.4. Rate the contribution of the website to supporting your studies within this module (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
4.5. Rate the duration of the meetings (In each module):	1=Very short duration, 2=Short, 3=Satisfactory, 4=Long, 5=Very long
4.6. Rate the number of meetings (In each module):	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
4.7. How systematically did you study the material of each module? (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
4.8. How many hours per week did you spend studying each subject? (In each module):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
4.9. Mention the most important positive elements in your opinion from the organization of each module:	Free text (long)

4.10. Mention the most important, in your opinion, negative elements from the organization of each module:	Free text (long)
4.11. Mention any improvements that, in your opinion, would be good to make in the organization of each module:	Free text (long)
5. EVALUATION OF THE ADMINISTRATIVE AND TECHNICAL SERVICES OF THE HOU	
5.1. Rate the support you had from the HOU administrative services on the various issues that concerned you:	1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory
5.2. Rate how easy you found the HOU website (https://www.eap.gr):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
5.3. Rate how easy you found the website of program (https://moodle.eap.gr):	1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much
5.4. Mention the most important, in your opinion, positive elements from your contact with the Administrative and Technical Services of the HOU:	Free text (long)
5.5. Mention the most important, in your opinion, negative elements from your contact with the Administrative and Technical Services of the HOU:	Free text (long)
5.6. You mentioned improvements that you would like to see made in the Administrative-Technical Services of the HOU:	Free text (long)

4. Results

Twenty-three (23) trainees participated in the evaluation of the program, carried out on a voluntary basis. As the program is at the postgraduate level, all the trainees are graduates. 61% of them stated that they already hold a master's degree. Regarding their professional activity, 31% stated that they are civil servants, 39% self-employed, 17% private employees and 1% unemployed. Regarding the individual axes 1-5 mentioned in chapter 4, the results are tabulated in Tables 3-8:

Table 1. Evaluation of tutors in terms of communication (1.1, 1.2, 1.3)

1.1. Evaluate the effectiveness of communication with your educator (In each module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)

1.3. Rate the tutor's effort to encourage you to formulate questions (In each module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)

1.2. Evaluate the tutor's effort to stimulate your interest in the subject of the module (In each module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)
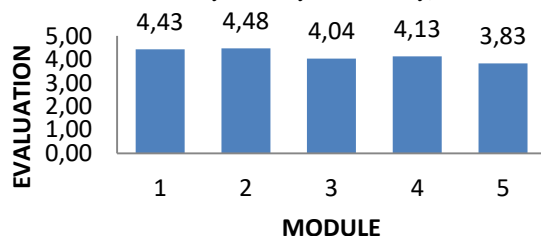

Table 2. Evaluation of tutors in terms of feedback/grading of written assignments (2.2, 2.3)

2.2 Evaluate the time response of your tutor in correcting assignments (In each Module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)

2.3 Rate how constructive your tutor's feedback was on your written assignments (In each Module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)
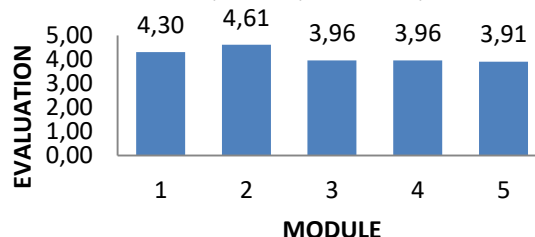
Table 3. Evaluation of training material (3.4, 3.9, 3.10)

3.4. Rate how understandable you found the training material:

(1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much)

3.9. Rate how interesting you found the specific educational material (In each module):

(1=Not at all, 2=A little, 3=Quite a bit, 4=A lot, 5=Too much)

3.10. Evaluate the contribution of the specific educational material to the understanding of the cognitive subject of the module (In each module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very…
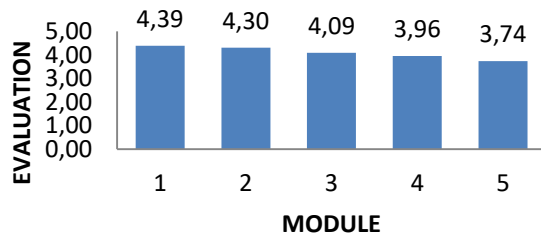
Table 4. Evaluation of each subject unit's structure (1.9, 1.10)

1.9. Evaluate the organization of the presentation of the material during the meetings (In each module):

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)

1.10. Evaluate the contribution of the meetings to the understanding of the content of module (In each module):

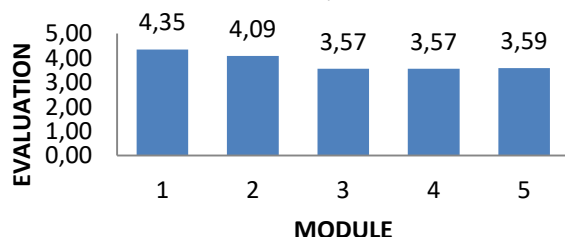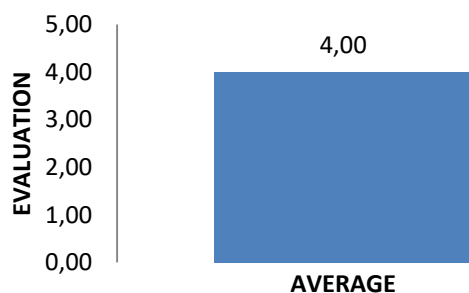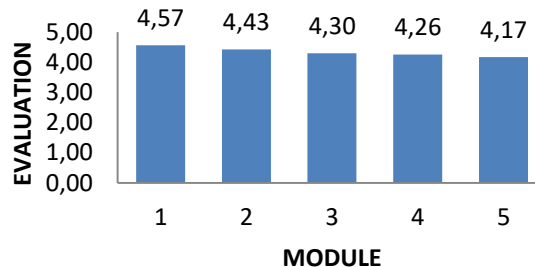(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)

Table 5. Evaluation of the administrative and technical services of the HOU

Table 6. Evaluation regarding the desirability of further engagement with the subject

5.1. Rate the support you had from the HOU administrative services on the various issues that concerned you:

(1=Not Satisfactory at all, 2=Almost Satisfactory, 3=Satisfactory, 4=Very Satisfactory, 5=Very Satisfactory)

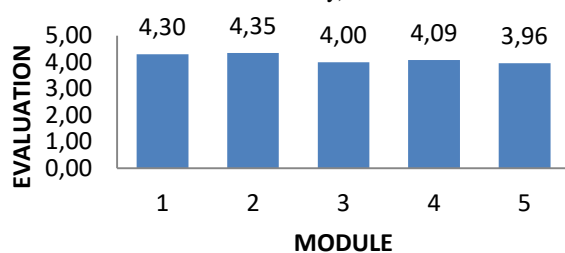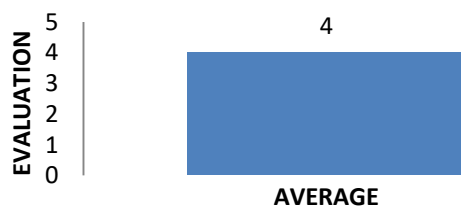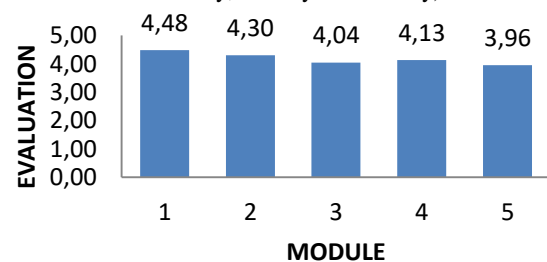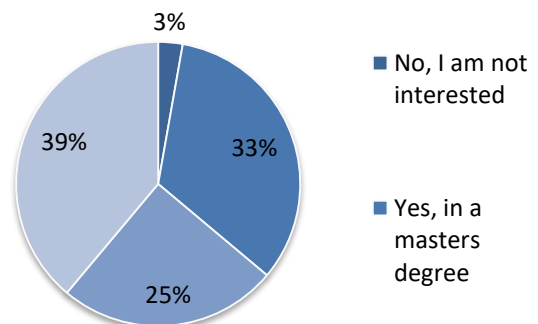**By completing the short program, would you be interested further with this subject?**

- No, I am not interested
- Yes, in a masters degree

5. Conclusion

The answers to the questionnaire show that the students were very satisfied with the program and evaluated it positively (Average grade > 4 out of 5). The limitation of time and the inevitable concentration of the material, as it is a short program, did not allow the deepening of knowledge at the specific modules, however, all participants were notified of the technical limitations of the program and the need to cover basic knowledge before the start of the program. It is particularly positive that the program was the trigger for further involvement with the subject for most participants (96% of participants wish to pursue further in the subjects), while 57% answered that they wish to continue their involvement with it at postgraduate level (although, in fact, 43% of them already hold a postgraduate degree). At the same time, 37% wanted to practice real technical skills with special equipment.

The result of the evaluation reflects both the personal feeling of the tutors during the meetings and the results of the exercises and activities. It is worth noting that the evaluation of the program through the questionnaire is an important tool for maintaining and - where necessary - improving the quality of educational services offered, combined of course with their continuous harmonization with current developments in science and the labor market. Taking into account the evaluation of the first two cycles, the program team invigorated the third cycle of the program with a live in situ skill training with state of the art topographic equipment at a real archaeological site in the Rafina –N. Voutzas district of Attica. Results on this addition will be evaluated after the completion of the cycle in 2023.

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Distance learning and Short Learning Program for continuous professional development: a case study of Hellenic Open University

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Abstract

The Hellenic Open University provides distance undergraduate and postgraduate education and training, with the development and utilization of appropriate educational material and teaching methods. The scope of the Short Learning Program "Special Curriculum of Pedagogical and Teaching Competence" (2 semester) is the graduates of the School of Social Sciences to acquire the necessary pedagogical and didactic knowledge, abilities and skills to successfully plan and implement educational work. This research involve 43 students using an online questionnaire during the academic years 2019-2021. The results were organized into three categories: 1. cognitive benefits 2. personal benefits 3. social benefits. The participants answered that the knowledge they obtained through the program helped them to create a safe pedagogical framework for their subsequent course in teaching. In addition, they feel that personal betting have been won and they have achieved their goal by rewarding themselves for their success. Also, they referred to the social benefits because through the program they came in contact with other colleagues, shared common concerns and worked as a long-distance team, something they had not done before. The technology and use of the computer ensured easy access of all participants from anywhere and at the same time access to information. The opportunity to participate in a program organized for distance learning played a catalytic role in the period of the COVID-19 pandemic and the confinement. As a consequence, academics can appreciate the value of this process and learners valorize it for their personal and social success.

Keywords: distance learning, short learning program, continuous professional development, Hellenic Open University.

1. Introduction

The Hellenic Open University provides distance learning education and more specific Short Learning Program for continuous professional development. This research analyses the views of students from the Short Learning Program and how this affected them in different aspects. The participants from 2 different academic years participated through the online questionnaire. In the second research year 2020-2021 interceded the pandemic COVID-19.

The COVID-19 pandemic prompted a rapid shift to distance education in all over the world. Using platforms and social media as a means for supporting active learning provides one pathway for overcoming the barriers of face-to face classes for the period of quarantine.

The availability of distance education and use of technology to deliver education or training to professional development was thought to allow cost-effective and equitable access in education. There are two aspects to research question; how distance learning promote the professional development; how effective is distance learning short program for students.

Below is referred the theoretical framework about the distance learning generally and more specific the case of Hellenic University and especially about the Short Learning program "Special Curriculum of Pedagogical and Teaching Competence". Subsequently, is referred the research methodology of the research. The data of the questionnaire were analyzed through thematic

analysis. From the results it is obvious that students have chosen consciously the short learning program for their personal and social matters.

2. Distance learning and continuous professional development

Distance learning, known today as on-line education, also has an interesting past in "correspondence courses" that were offered by many universities beginning in the late nineteenth century. On-line education is today's most rapidly growing part of higher education (Deming, Goldin & Katz, 2012). The term distance education refers to an organized framework with specific conditions. Distance learning as a continuous education policy has established the teacher's physical absence from the organization and the production of specially designed teaching manuals (Lionarakis, 2001; Bozkurt & Sharma, 2020). It is a complex process that requires careful planning and determination of objectives to create an effective learning process for the continuous professional development (CPD). CPD consists of conscious and planned learning experiences and activities intended to provide direct or indirect benefits in order to help educators to succeed and enables students to learn by changing classroom practices (Day, 1999; Muksin, Sukardi, & Soenarto, 2021).

In the new era of digital classes, the distance learning plays a crucial role due to the internationalization of higher education systems and shared governance. The integration of information and communication technologies (ICT) in teaching differentiates learning processes, because it contributes to the improvement of curricula, course material and the way it is presented. The possibility offered by access to the internet, on the one hand, serves students, so that they can access information at any time, wherever they are. On the other hand, it plays a key role in the educational process and teaching practices. At the same time they have the possibility and the freedom to choose what they want to study according to their needs and personal choices (Tzafea, 2022).

Distance learning gives the opportunity to the learners the flexibility in space and time because there are no restrictions. The use of ICT enables modern and asynchronous education.

The European policy instruments support more flexible educational pathways with clear rules for the recognition of previous learning and study achievements. More diverse program levels – e.g. short degrees – offer a greater variety to students in terms of flexibility to switch, to "academically socialize", to qualify for a next level or to manage expectations of students and labour market needs. Short programs may be a chance for students who are interested in a more vocationally oriented higher education without being "locked in" too long. Broad entry years may help students who were uncertain about the exact direction of their study choice. Flexible educational pathways give students the possibility to gear their study program according to their interests (Vossensteyn et.al., 2015, p.12-71)

3. The case of "Special Curriculum of Pedagogical and Teaching Competence" - Hellenic Open University

The Hellenic Open University provides distance undergraduate and postgraduate education and training, with the development and utilization of appropriate educational material and teaching methods. The aims of the Hellenic Open University include the promotion of scientific research, as well as the development of technology and methodology in the field of distance knowledge transmission. According to the valid international ranking of Webometrics, the Hellenic Open University ranks 4th in the world among 147 Institutions of open and distance education (https://www.eap.gr/en/).

The scope of the Special Curriculum of Pedagogical and Teaching Competence is the graduates of the School of Social Sciences to acquire the necessary pedagogical and didactic knowledge, abilities and skills to successfully plan and implement educational work.

Adult learners are looking for small units of study that meet their goals and develop higher education-level skills. They want to be awarded with qualifications recognizing the depth and level of learning based on a trusted assessment.

This short learning program for continuous professional development deliver a certificate to students to be able to understand the principles of Pedagogy and the factors that influence it, to know and apply modern teaching methods, to know the principles of learning psychology as well as to be able to manage phenomena that arise in the school environment. Also, provides all the necessary knowledge to the candidate teacher to acquire the best possible and effective knowledge of pedagogy, psychology and teaching methodology. the program includes 3 group meetings via the platform WEBEX (https://www.eap.gr/en/special-programs/pedagogical-and-teaching-adequacy/).

4. Research Methodology

This study was implemented during the "Special Curriculum of Pedagogical and Teaching Competence" and more specific after the completion of the first introductory module of the short program using an online questionnaire during the academic years 2019-2021. The data collection was carried out by the students after the end of the three online group meetings via internet and especially the platform WEBEX in the end of semester. The questionnaire includes questions that ask the students to describe their views about the program and especially the first general module. The questions were organized into three axes: 1. their perspective on distance education in general, 2. their perspective on the particular program they have chosen, 3. their views from their professional experience of completing the module. Below are referred the indicative questions:

What are your general impressions of the module?

What are the benefits you have gained participated in the module?

What is your opinion on distance education?

What do you consider the "negative" points in distance education?

The research involved 43 students using an online questionnaire during the academic years 2019-2021. The 29 out of 43 are women and the 14 out of 43 are men. All of them have a Bachelor degree in Economics and 10 of them have a Master degree. One of the 43 has a PhD diploma.

The sample is not representative, but purposeful in the sense that it included the students that have enrolled the program.

5. Analysis

According to Maguire (2017) "Thematic analysis is the process of identifying patterns or themes in qualitative data". Thematic analysis aims to identify themes, i.e. recurring patterns in the data that are important and worth talking about. With these patterns the researcher tries to locate useful data related to the researched issue. Thematic analysis is more than just summarizing the data. Essentially, thematic analysis interprets and understands context.

Braun & Clarke (2006, p. 3, cited in Maguire, 2017) provide a five-step guide that is a very useful framework for conducting this type of analysis. These are: Stage 1: Familiarization with the data, Stage 2: Generating initial codes, Stage 3: Searching for themes, Stage 4: Screening themes, Stage 5: Defining themes.

The first stage in any qualitative analysis is to read the transcripts. In the second stage we begin to organize the data in a meaningful and systematic way. Coding reduces a lot of data into smaller chunks of meaning. As defined earlier, a theme is a pattern that captures something important or

interesting about the data. In this case we looked at the codes and some of them clearly fit into a theme. During the fourth stage we review, modify and develop the preliminary themes identified in the third stage. The fifth stage is the final refinement of the themes and the aim is to ".. determine the 'essence' of the theme (Braun & Clarke, 2006, p. 5, cited in Maguire, (2017).

6. Results

The results were categorized in three themes: 1. cognitive benefits, 2. personal benefits, 3. social benefits and 11 sub-themes.

In the first theme 1. cognitive benefits are submerged 4 sub-themes: 1.1 change of thinking, 1.2 new strategies, 1.3 knowledge of pedagogy and teaching, 1.4 active learning.

In the second theme 2. personal benefits are submerged 4 sub-themes: 2.1 active/non participation, 2.2 open minded, 2.3 cultivate abilities, 2.4 cost reduction.

The third theme 3. social benefits are submerged 3 sub-themes: 3.1 communities, 3.2 socialization/social distance, 3.3 alternative ways of communication.

1. Cognitive benefits

For the first theme "cognitive benefits" the participants answered that the knowledge they obtained through the program helped them to create a safe pedagogical framework for their subsequent course in teaching. Also, they had the opportunity to learn about theoretical and applied pedagogical science, the alternative pedagogical approaches and the alternative assessment approaches. More specific:

1.1 change of thinking

"A change in the way of thinking about the child, his treatment and the important work of the teacher"

Students they feel that they learn more specific about the child development and children's learning processes. This was α crucial phase for changing the way of thinking and dealing with educational issues. Their opinions were self-assessed and modified due to the new knowledge.

1.2 new strategies

"Understanding forms of teaching, managing and dealing with situations in a school environment, choosing an orientation for future teaching"

Students through the exercises and teamwork they were challenged to find solutions and they discussed new notions. The process of organize and produce the new cognition generate new learning strategies for them. This is a very significant procedure for the cognitive development.

1.3 knowledge of pedagogy and teaching

"Obtaining a clear picture of the basic elements of pedagogy, in order to enable future engagement in greater depth".

"Knowledge of pedagogical and teaching methods and their presence in a very interesting way"

"I learned educational approaches where I didn't know them before and it helped me understand several concepts"

The core of Pedagogy contain many concepts, definitions and approaches. Also, the Pedagogic Science borrows and shares many data from other Sciences and this many times make a difficulty in understanding from students which have no contact before. So, in order to have a clear picture for the solid of Pedagogy, it requires deep study and make comparisons.

1.4 active learning

"I learned many unknown pedagogical topics which we discussed case studies in teamwork"

However, not only deep study is required, but also new cognition should be applied in exercises

which designed in teamwork. They discuss in plenary, reflect and propose possible scenarios for the pedagogical framework. This process has a successful result of active learning.

2. Personal benefits

The second theme "personal benefits" indicates that students felt that personal betting had been won and they had achieved their goal by rewarding themselves for their success.

2.1 active/non active participation

"It's a great opportunity to participate at this particular period (COVID-19), when there was no possibility for anything else"

"It worked perfectly for me. I actively participated. There was no other way I could complete the program"

"participation could be more interactive in face-to-face meeting"

Students prefer to face-to-face learning due to the interaction among them. However, there are opinions which express the active participation in this program. The group meetings and teamwork gave them the opportunity to communicate and exchange views. As a consequence they had have an active participation by contrasting their opinions. Also, they said that the only solution in COVID-19 period it was the distance learning program. This made them feel more active, otherwise they didn't have alternative ways to be active because of quarantine.

2.2 open minded

"It made me better as a "human being"

"changed my way of thinking. I became more open-minded"

"the program is condensed and I immediately realized my anachronistic views. I think more openly"

Due to the short duration in this learning program, the structure and the content is organized in such a way that the students can immediately perceive the pedagogical profile that places themselves. This is a good chance in order to have disagreements and discussions with themselves. The process of reflection make students be open minded.

2.3 cultivate abilities/skills

"I improved both my ability to process educational material and skills such as IT skills or translate written texts through assignments".

"I improve computer and IT skills"

"I was able to decide what kind of teacher I will be in the future and what approach I will follow as well as how I will plan the delivery of the lesson so that the lesson is enjoyable and interesting for the students"

"Strengthening my personality, developing my skills and abilities"

There is no doubt that participating in an active learning process cultivates the professional skills and develops the abilities of the participants. The difference from other Pedagogical and Teaching Competence programs is that the students have the chance to do weekly self-assessment digitally exercises, read from different digital sources, participate in teamwork via digital platform, participate in evaluation and reflection processes in a digitally way. These abilities are professional and make them believe more in themselves.

2.4 time and cost reduction

"it gives everyone the opportunity to attend (regardless of where they live) and saves valuable time and money"

"Particularly practical with significant benefits due to saving time and costs of travel".

"For reasons of distance, family and professional obligations I would not be able to attend face-to-face meetings"

All of the participants answered that a significant personal benefit is the time and cost reduction. Many of them are parents and have little time and a lot of expense in order to spend time and money on the movements and transition to the institution. So, saving time and money is important to them because they can allocate it elsewhere.

3. **Social benefits**

Students refers to the social benefits because through the program they came in contact with other colleagues, shared common concerns and worked as a long-distance team, something they had not done before.

3.1 communities

"I have acquaintances and experiences with my colleagues"

"I met other people and different ways of thinking"

To be a participant in a learning community gives the opportunity to have common experiences, share your ideas and compare them with other colleagues. It is so special for these students to be a part of this community, that they feel strong and they expand the networking.

3.2 socialization/social distance

"there is no contact with the teacher and there is no exchange of opinions/perceptions with fellow students to such an extent"

"It cannot replace the classic face-to-face training, but it presents in some points much greater advantages than it"

"we participated in a social media group το exchange opinions and express questions"

"i feel more safe in distance learning"

"I believe it does just as good a job as face-to-face training"

"I consider that it is in no way inferior to face-to-face communication, in fact I consider it is more practical. I can be in the same group with a fellow student who is in Crete while I am in Kastoria".

The students have the opportunity to be socialized digitally. It is a good chance to meet new people and have mates with common goals from everywhere. It is notable that during the quarantine period social distancing due to COVID-19 made people feel lonely and isolated. The participation in distance learning program make them feel more safe. Also, they participated in social media group in order to have better cooperation and socialization.

3.3 alternative ways of communication

"Communication with remarkable people and teacher"

"people who live in remote areas where there are no schools have the opportunity to attend classes. And in this way you can meet people and communicate from other areas"

"It is a way of training but I believe it should not be done permanently except to serve some emergency situations like the one we are experiencing".

"It can be a combination of work and study, saving time and due to viruses we can communicate absolutely secure".

"Very good alternative teaching practice. Necessary in the present circumstances COVID19".

"Excellent and at this time (COVID-19) there was no possibility for an alternative way of communication"

The primary interactions in many of the online classes happen between an individual learner and the course management system with limited and sparse social interactions (Xu & Xu, 2020). However, it is obvious from the answers that students feel more safe and active with the distance learning lectures because of the pandemic. Due to a longterm lockdown the only way of teaching was the distance learning method. Students have the possibility to follow the courses through a digital framework, something that was not possible for the face-to-face meetings in other programs.

The technology and use of the computer ensured easy access of all participants from anywhere and at the same time access to information. The opportunity to participate in a program organized for distance learning played a catalytic role in the period of the pandemic and the curfew.

During the distance group counseling meetings through Webex, working groups were created to which small projects were assigned, such as showing a short film and commenting in plenary by each member of the group.

7. Restrictions

The limitations of the research are that the sample is clearly small in participants, so new researches with more participants is needed. Also, the data ware collected over a period of time which interceded the pandemic COVID-19.

8. Conclusions

From the results it is obvious that the short learning program "Special Curriculum of Pedagogical and Teaching Competence" through distance learning have many benefits in all participants. Of course there are drawbacks which are significants.

The use of ICT is universal and essential in distance education. The results of researches showed that participants developed their ICT skills and included this in the benefits they received from the program. In this research the students replied that they improve their computer skills.

The use of digital platforms with its user-generated content and online meetings, can help reduce some of the distance, or feelings of disconnection, that students experience in distance education (Smith & Taveras, 2005). Being able to meet students with common interests gives them a sense of belonging.

Reviews of the educational research literature suggest that digital platforms could help improve students' experiences of distance learning education by facilitating active learning and socialization. Also, the participation in common group meetings can help foster active learning. Defined as learning that immerses students in their own learning processes, requiring them to critically evaluate their work, make connections to their prior knowledge and reflect on metacognitive strategies, active learning is essential to education and the design of quality instruction (Bransford et al., 2000 cited in Greenhow & Chapman, 2020).

The International Society for Technology in Education (ISTE) (2018) established standards that emphasize students' community connection and citizenship: *"students are encouraged to work in teams, expand their perspectives, express themselves and understand their responsibilities as contributors to a global, digital society. Although it can be difficult for students to feel a sense of camaraderie and community in formal learning management systems which emphasize content delivery and are controlled by their professor, on digital platforms, students can build community with classmates as well as experts and organizations brought into the learning space through their networking features" (Manca and Ranieri, 2016 cited in* Greenhow & Chapman, 2020).

Sush a Short degree programmes and 'student-designed programmes' enabling students with a clear study objective to collect adequate programme elements. A more fluid, evolving, and flexible approach through stackable credentials may provide more opportunities for people and

also reward industry and society with quicker evolution in parallel with societal needs. At the institutional level, creating student engagement; the matching of students and study programmes; teaching and learning initiatives to develop more student-centred and active learning approaches; systematic tracking and monitoring of students' success; and the organisational context surrounding study programmes (full-time versus part-time study, rules and regulations concerning admission and progression) are considered most important (Vossensteyn et.al., 2015, p.56- 89).

Distance learning education fits many of the features of the for-profit business model. For example, it attracts older students who need to combine work with schooling and appeals to students who do not want to learn on the academic calendar (Deming et al., 2012).

Research has shown that distance learning is a promising opportunity to reduce costs in higher education and for students themselves. In the specific survey, the students answered that they preferred such a program because they save money and time. However, there are also research results that show that face-to-face communication cannot be replaced by distance communication. At this point there were replies from the students in which they express the difficulties they face in distance education, mentioning the qualitative difference that exists when they are close to the other fellow students and the professor.

Thus, perhaps a more compelling question is whether online technology has the potential to deliver a similar quality of education in a less expensive manner than brick-and-mortar instruction (Xu & Xu, 2020).

It is important to organize communities of support for distance learning students and to share the knowledge and experience we have in providing effective and meaningful learning processes and teamwork support (Sounoglou, 2022). These learning processes, of course, should not aim at sterile knowledge, but be directed towards empathy and interaction between both students and professors. Due to technology is a powerful tool and not a purpose (Bozkurt & Sharma, 2020) the effective use has important consequences in our pedagogical practices (Zaimakis & Papadaki, 2021).

As a consequence, it is almost possible academics estimate the value of this award and learners valorise it for their personal and social success.

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Website links

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Institutional Policies on Micro-Credentials

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Abstract

In a world that is rapidly changing, investing in lifelong learning and flexible learning pathways is swiftly becoming an issue of key importance. Increasing numbers of compact learning opportunities known as micro-credentials, are being developed across Europe and around the world. Yet despite this, there is still no common definition or standards to describe, design and recognize micro-credentials. What is more, higher education institutions act within very different contexts and often have quite differing objectives with regard to micro-credentials.

In the "Modular Continuing Higher Education by Micro-credentials (MCE)" project, we map and analyze existing institutional qualifications for continuing education and professional development (CEPD). In addition, we also compare institutional policies, strategies and frameworks for CEPD and micro-credentials. The 10 project partners were asked to fill out a comprehensive questionnaire on institutional, quality and funding policies regarding micro-credentials. The findings provide us with an important evidence base and will support further institutional developments for the transformations needed to ensure high-quality, trusted, and widely recognized micro-credentials.

The initial findings have already revealed how differing contexts in each country are reflected within institutional strategies. The course of ongoing higher education policy debates coupled with differences in financial and legal framework conditions are having a high impact on the strategies used, the design and even the understanding of what a micro-credential actually is. Major differences can be seen across the spectrum, for example in the denomination (micro-credential being only one of several terms used), scope (number of ECTS credits awarded), creation (modularization of existing programs vs. newly set up courses), stackability, and range of fees charged.

Keywords: Micro-Credentials, Institutional Strategies, National Policies

1. Introduction

Around ten years ago, the introduction of Massive Open Online Courses (MOOCs) seemed set to turn the higher education sector on its head, sparking off a great number of discussions about the meaning and significance of degrees. However, while MOOCs still only play a minor role and have had a limited impact on higher education systems (despite the fact that open and distance-learning universities are being challenged by new competitors such as Coursera, Udemy, etc.), there was another ongoing debate on the role of degrees,

in the context of discussions on teaching in higher education. Just a few years ago, an issue of The Chronicle for Higher Education was published with the title "The future of the degree" (Selingo, 2017). A working group of the International Council for Open and Distance Education (ICDE) concluded "By providing a digital, information-rich record of workplace-relevant skills and competencies, attributed to an individual, ADCs (Alternative Digital Credentials) will challenge the relevance of traditional university transcripts." (ICDE, 2019, 3).

The term "Alternative Digital Credentials" stands alongside several other terms that are used in a similar, but not always identical way, such as badges, micro-degrees, nano-degrees, micro-masters or short learning programs (SLPs). This concept of small learning opportunities is of great importance, not only to EADTU members but also to the European Commission itself. Therefore, in 2018, 14 partners launched a project on "European Short Learning Programs (eSLP)". This three-year project, funded by Erasmus+, developed SLP characteristics and guidelines as well as recommendations for quality assurance, recognition, etc.

In the meanwhile, also due to the Covid-19 pandemic, there was an increasing demand for short, flexible and tailored learning opportunities, and consequently, the topic of micro-credentials, "that certify the outcomes of these small learning experiences" (s. EC 2022c) became more and more important also at a European level.

> In her political guidelines, Commission President Ursula von der Leyen states her intention "to bring down barriers to learning and improve access to quality education," underlining the relevance of inclusion and quality in lifelong learning as stated in the European Pillar of Social Rights. The Skills Agenda (July 2020) puts forward a strategy to help individuals develop skills in a rapidly changing labor market and announces a new initiative on micro-credentials. The Communication on achieving a European Education area by 2025 (September 2020) announces a Council Recommendation in 2021 to support building trust in micro-credentials across Europe and aims at having all the necessary steps in place by 2025 for their wider use, portability and recognition. This will widen personalized learning opportunities for all and contribute to more flexible learning pathways throughout life. A European approach to micro-credentials is included in the Commission Work Programme 2021 under the headline ambition "Promoting our European way of life." (EC 2021c)

The European Commission aims to meet the necessary requirements and establish a supporting infrastructure within 5 years to pave the way for micro-credentials and is therefore also funding several projects on micro-credentials. One of these is the successor to eSLP, the project "Modular Continuing Higher Education by Micro-credentials (MCE),"[1] which started on 1 April 2022. MCE will contribute to the further conceptualization of micro-credentials and support transformative institutional developments in the interaction with national and EU policies and frameworks. Under the coordination of EADTU, the 10 partners[2] will be working for the next three years on topics such as the learner perspective and contexts of micro-credentials and modular education.

In this article, we describe a survey that is conducted within the MCE project concerning institutional strategies for micro-credentials. We show the results and discuss the findings, but we start by describing the political background of the project.

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[1] https://mce.eadtu.eu/index.php
[2] These are: Università Telematica Internazionale UNINETTUNO, UNED, Universidade Aberta, FernUniversität in Hagen, Hellenic Open University, Open Universiteit, Open University of Cyprus, Kaunas University of Technology, UOC, KU Leuven.

2. Background – The European Approach to Micro-Credentials

In the past few years, there have been numerous consultations and discussions on micro-credentials at the European level. In 2021, the Council of the European Commission published their "Council Resolution on a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021–2030)" (EC 2021a) and mentioned micro-credentials as one of the many items in their priority areas during the first cycle 2021–2025 (EC 2021a, p. 17): "Exploring the concept and use of micro-credentials can help widen learning opportunities and could strengthen the role of higher education and VET in lifelong learning by providing more flexible and modular learning opportunities, and offering more inclusive learning paths" (EC 2021a, p. 18). What initially sounded like a somewhat vague approach to micro-credentials, rapidly took a more concrete turn. In December 2021 the Council of the EU published its "Recommendation on a European approach to microcredentials (sic) for lifelong learning and employability" to member states. It was adopted in June 2022 and "seeks to support the development, implementation and recognition of micro-credentials across institutions, businesses, sectors and borders" (EC 2022c). By the end of 2023, it is supposed to be implemented at national level. It was published alongside another proposal on individual learning accounts (s. EC 2021d) and shows the growing importance of flexible and inclusive learning opportunities as well as lifelong learning.

The recommendation involves a common definition and presents European standard elements to describe micro-credentials (Annex 1) alongside "principles for the design and issuance of micro-credentials" (EC 2021b, Annex 2). The press release concerning the recommendation highlights its goals, which include "[b]uilding trust [in micro-credentials] and enhancing [their] flexibility" and "[f]illing the skills gaps" that the COVID-19 pandemic as well as the green and digital transition have caused (EC 2022b), this also emphasizes how urgently they are needed in our constantly changing society and labor markets. However, there is also a necessity to enable people to cope with current and future challenges, and "[a]n effective culture of lifelong learning is key to ensuring that everyone has the knowledge, skills and competences they need to thrive in society, the labour market and their personal lives. It is essential that people can access quality and relevant education and training, upskilling and reskilling throughout their lives." (EC 2022b, p.4)

According to the definition given by the EC recommendation, "[a] microcredential (sic) is a record of learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes are assessed against transparent and clearly defined criteria. Learning experiences leading to microcredentials (sic) are designed to provide the learner with specific knowledge, skills, and competencies that respond to social, personal, cultural, or labor market needs. Microcredentials (sic) are owned by the learner, can be shared, and are portable. They may be standalone units or combined into larger credentials. They are underpinned by a quality assurance system that follows agreed standards in the relevant sector or area of activity." (EC 2021b)

The official EU definition is thus much broader than comparable ones elaborated within the Micro-Credentials Higher Education Consultation Group (EC 2020) and the eSLP project, for example. Nevertheless, certain ideas and criteria become apparent: Quality and transparency are prominently placed as the two first principles, reflecting the demand for fit-for-purpose, clearly documented internal and external quality assurance as well as clear information on learning outcomes, workload (ECTS credits), content, level (European Qualification Framework, EQF/National Qualification Framework, NQF), and the learning offerings. An assessment is clearly still needed. Micro-credentials should be relevant, i.e., should be designed as distinct, targeted learning achievements that meet identified learning needs. The EU believes that micro-credentials will help to create flexible learning pathways, which include the possibility to 'stack,' validate and recognize micro-credentials from across different systems.

3. Survey of Institutional Strategies and Policies on Micro-Credentials

Within the aforementioned MCE project, the FernUniversität is leading a work package on institutional leadership and micro-credentials. The objective of WP3 is to support university leadership in the development and progressive implementation of transformative institutional policies, strategies, and institutional preconditions for forward-looking CEPD and micro-credential programs and qualifications in response to the demands and expectations of learners, the economy, and society. Specifically, the objectives include comparing institutional policies, strategies and frameworks for CEPD and micro-credentials in light of new perspectives on the transformation of higher education and the future of the European University 2030, taking the learners' perspective into account (mainly dealt with in WP2 on *Investigating modularization and micro-credentials from the learners' perspective*) as well as analyzing and mapping the current institutional qualifications for continuing education and professional development within the partnership. Further goals are to harmonize and align micro-credentials in line with EU policy and build an institutional ecosystem for continuing education.

In order to accomplish the first two of these objectives, the FernUniversität asked all of its project partners to fill out a comprehensive survey in May–July 2022. The survey was composed of the following three sections: Institutional Strategy and Frameworks (a), Quality Policies (b), and Funding Policies (c). It was created as an online form using the open source tool LimeSurvey and was mainly made up of single- or multiple-choice questions as well as a small number of open answer questions. Not all of the partners were able to respond to all the questions in the survey. The participants were invited to base their answers on all the institutional offerings that might fall under the definition of the EC Recommendation, irrespective of whether they call them micro-credentials (yet) or not.

4. Initial Findings

4.1 Institutional Strategies

Despite the differing contexts in which the higher education institutions act, all of them have the topic of micro-credentials on their agenda: All of the partner universities already have institutional strategies on micro-credentials or at least plans for one, even where micro-credentials are not (yet) titled as such. 7 out of 10 partners state that "micro-credentials/small learning experiences" are an important part of their university strategy. In some cases, micro-credentials are quite strongly promoted as an integral part of university strategy (e.g., Spain).

The institutional strategies of all of the partners include corresponding terms such as "lifelong learning" and "continuing education and professional development," and almost all of them focus on "innovation in learning, educational content and modes of delivery," "learner-centered education," "non-traditional learners," "employability" and "flexible learning pathways/modular education." The topic is also often structurally anchored in lifelong learning/continuous education units/centers (e.g., Portugal, Cyprus, Greece) or inter-institutional working groups (e.g., Belgium).

Most micro-credentials have been initiated less out of the self-interest of the teachers/institution, but are rather market-oriented/demand-driven. In some cases, they respond to the formulated needs of policymakers or companies or are designed together with and explicitly for a certain employer (B2B2C).

All of the institutions collaborate, to a certain extent, with partners (education and training organizations, other providers, employers, professional organizations, social partners, users of micro-credentials) in the

design and delivery of micro-credentials, most particularly with regional/national employers. At an international level, cooperation is frequently sought with other education providers.

When asked about future prospects, all of the partners agree that the role of micro-credentials in their institution will become more important by 2025. Similarly, all of them expect active encouragement concerning the design and delivery of micro-credentials at their institution to become even greater within the next three years.

4.2 Funding Policies

A crucial part of any ongoing project is its financing, which in turn impacts on institutional strategies. That is why, in the third part of the survey, partners were interviewed on the funding of their continuing education offerings in general and micro-credentials in particular. Interestingly, very few of the partners have yet developed a dedicated business model for micro-credentials.

University-based continuing education and professional development (CEPD) in general is often not publicly funded (6/10), with the exception of some specific "post-COVID-19" funding, public calls, etc. Likewise, micro-credentials are rarely publicly funded. The primary source of financing the micro-credentials offered is clearly student fees (6/9) (Figure 3).
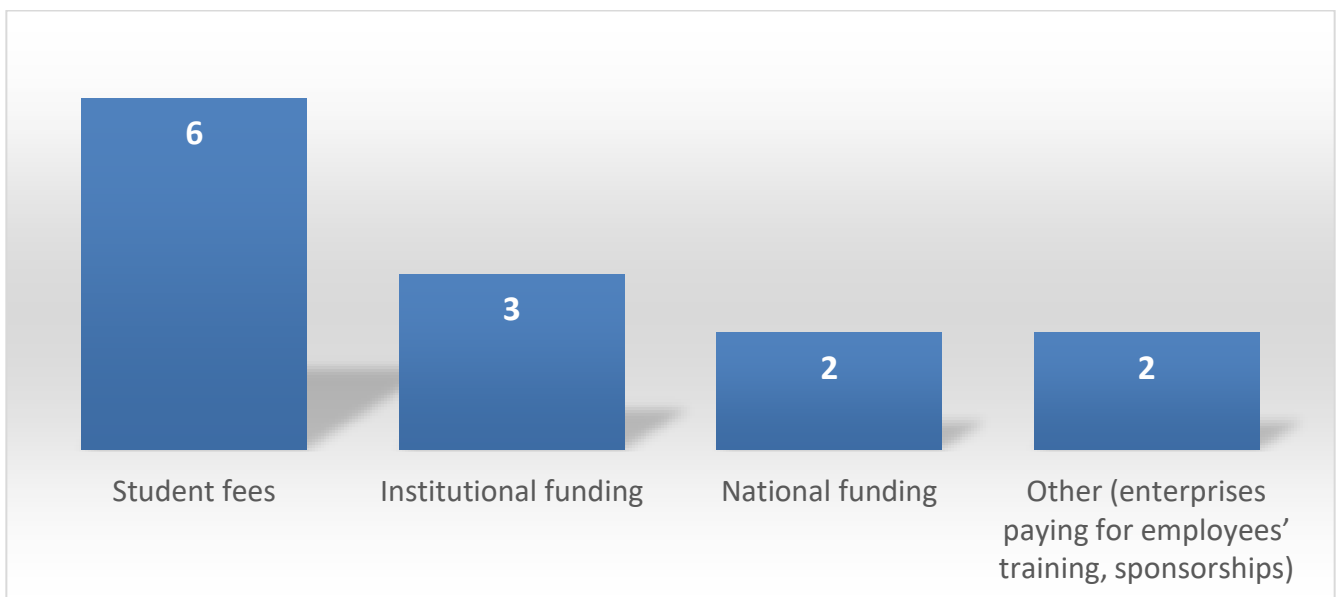
Figure 3: Primary Sources of Financing

Student fees differ enormously from institution to institution and from offering to offering: The range starts with micro-credentials offered completely free of charge and goes up to 9000 euros per micro-credential. Likewise, the amount paid per ECTS credit for micro-credentials ranges from 70 to 400 euros. In relation to the respective cost of living, almost all of the partners estimate that at least 50% of the population in their country can afford micro-credentials; for 3/8 of the partners, this figure is at least 80%.

4.3 Characteristics and Understanding of "Micro-Credentials"

Differing contexts, reflected in the institutional strategies, greatly impact the design and understanding of what might be called micro-credentials.

Almost all of the micro-credentials offered at the partner institutions are (according to the EC Recommendation) ECTS- and EQF-based (7/10), many are also learner-centered (5/10). Another similarity is that very few are interdisciplinary in nature and that English-language offerings are the exception (except in Latvia).

However, there are major differences when it comes to other characteristics. Half of the partners primarily offer micro-credentials with an academic orientation, while the other half focus on labor-market/vocational learning outcomes. At four out of ten institutions, all learners in micro-credentials have the same legal status as bachelor's or master's students; at four other institutions, all students have different statuses; in the two remaining institutions, the students' legal status depends on the specific micro-credential they have registered to. The picture is similarly multicolored when it comes to the origin of micro-credentials: Half of the partners offer micro-credentials that result from the modularization of existing programs or courses. Four partners do so with many or all of their micro-credentials. Portugal is the only partner where all micro-credentials are explicitly set up from scratch.

All of the above-mentioned findings refer to all the courses or programs that the institutions understand as being a micro-credential according to the definition in the EC Recommendation. That does not necessarily mean that these offerings are titled as such.

Six out of nine partners already use the term "micro-credential". However, what is meant by that varies greatly from institution to institution. The most significant variation is the range of ECTS credits from 1–30, or 26–700 hours of study (Figure 1). The academic level of study lies mostly at EQF 6 or 7 (i.e., bachelor or master), sometimes also 5 or 8 (preparatory or doctoral level) (Figure 2). Half of the partners report that the micro-credentials offered are (mostly) stackable; one university offers only standalone courses. Half of the partners issue a Diploma Supplement for students who have successfully completed their micro-credential.
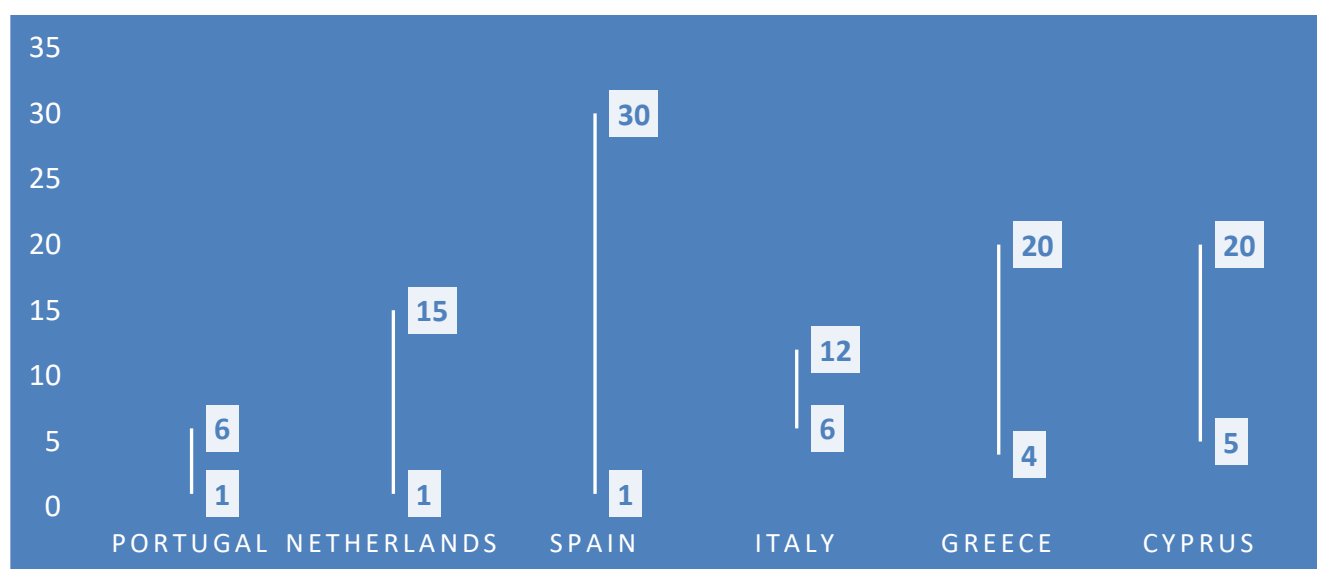

Figure 1: Range of the Scope of Micro-Credentials (in ECTS credits; selection)
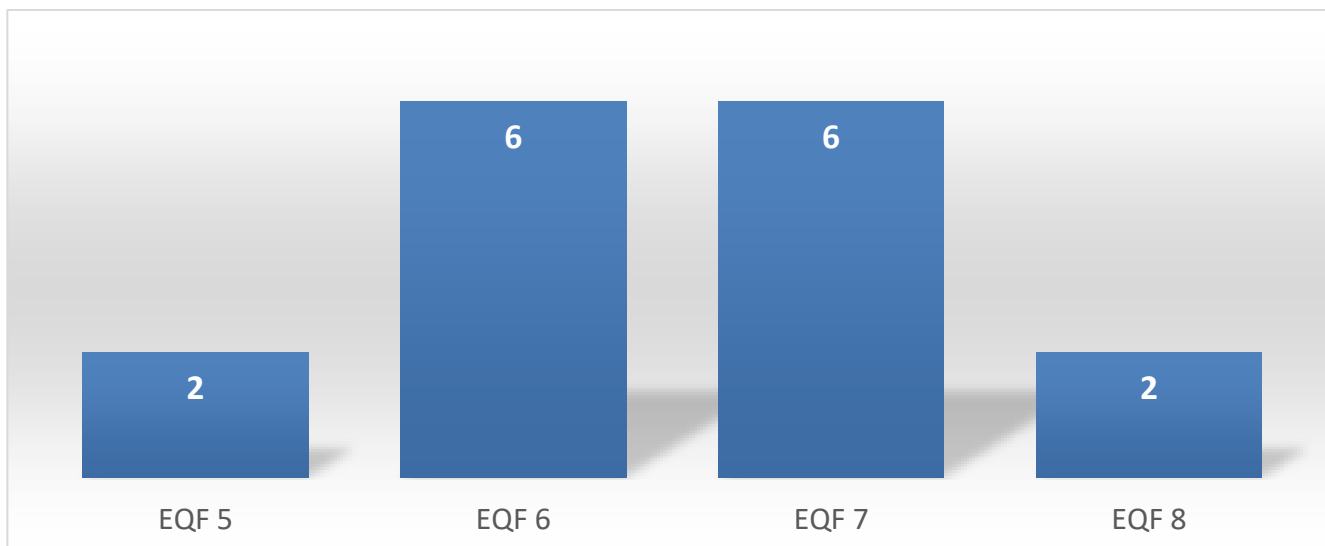
Figure 2: EQF Level of Micro-credentials

In addition to the term micro-credential, a variety of other designations are used. "Short learning program" (7), "certificate" (7), "professional course" (6) and "diploma" (2) are the most widespread, along with seven other denominations, e.g., "Continuing education with certificate of attendance," "MOOC," "open teaching." However, all these terms in turn are understood quite differently with regard to the number of ECTS credits, number of study hours, EQF level, diploma supplement, stackability, etc.

4.5 Quality Policies

The European Commission highlights the importance of quality as a primary principle for the design and issuance of micro-credentials (annex II of EC 2021b). It is agreed by all stakeholders that a wider acceptance of micro-credentials is not possible without a clear and transparent underlying quality assurance system. A section in the survey was therefore dedicated to quality policies concerning micro-credentials. In this sense, the finding that all partners have (more or less well-defined) plans for improving quality assurance can be read as revealing.

At most institutions, micro-credentials are only evaluated internally (6/10). The internal quality assurance processes are generally based on or are comparable to the external ones for bachelor/master programs though, thus ensuring a certain degree of consistency. The exception to this rule are micro-credentials that form part of bachelor or master programs: these are evaluated externally. At eight out of nine institutions, learners are involved in quality assurance processes, mostly via surveys after the course.

When asked about quality assurance in practice, the partners' answers are quite consistent. At all of the institutions surveyed, the professors and other academic staff develop and teach the micro-credentials offered; only one university also offers additional teaching by external trainers. All of the partners regularly update their course material. Assessments for micro-credentials are usually supervised using a form of identity verification, no matter whether they take place online (9/10) or on site (7/10). Assessments without any identity verification (supervised or unsupervised) are rather the exception.

Obtaining micro-credentials is usually possible following an assessment of the learning outcomes obtained through a specific course leading to a micro-credential (9/10). In contrast, the recognition of prior learning and assessments of learning outcomes resulting from non-formal and informal learning are much less widespread.

Digital credentials such as Europass are not (yet) being used, and only one institution certifies its offerings digitally only (but not (yet) under European micro-credential standards).

Interestingly, only seven out of ten institutions recognize micro-credentials issued by other higher education institutions based on standard recognition procedures. At three of these, this is contingent on certain conditions (e.g., a clear indication of the EQF level and the number of ECTS credits, or an inter-institutional agreement).

4.3 Assumed Learners' Motivations

To date, there is not much data on the learners of micro-credentials and what motivates them to sign up for a micro-credential. Even the partners surveyed could only give good guesses based on their daily experience in offering micro-credentials. Findings from MCE project work package 2 will deliver a reliable evidence base in this regard. Nonetheless, it makes a huge difference to institutional policies which type of learners with what kinds of motivations are targeted. Therefore, the survey included questions regarding this matter as well.

Most of the partners maintain that the majority of their micro-credentials students are lifelong learners. Five out of ten partners state that most learners already have a bachelor degree when enrolling; seven out of ten, that some students already have a master degree before they delve into a micro-credential. Five out of nine partners assume that micro-credential learners are likely to study again at their institution. In contrast to the expressed EC expectation, few micro-credential learners are believed to belong to disadvantaged and vulnerable groups.

As regards the assumed motivations of learners, the answers are also relatively consistent. The main motivations – in line with the EC Recommendation – are expected to be the "wish to ensure employability and career progression" and to "use the micro-credential for up- or reskilling to better fit labour market needs." Likewise, the intrinsic motivation (students wishing "to learn for their own personal development") are high on the score. In contrast, students wishing "to orientate themselves as regards studying" and who "use the micro-credential to meet regulatory requirements in their job (mandatory training, etc.)" are only expected to play a marginal role. Interestingly, lack of time or money is not assumed to be a relevant factor when it comes to micro-credentials. Very few partners assume that all or most of their micro-credential learners do not have the time for a whole degree program, none that they do not have the money.

4.1 Differing (National) Contexts

The existence of very different framework conditions for micro-credentials in the individual countries across Europe was one striking revelation of the survey results. Although micro-credentials and smaller educational programs are explicitly supported by the corresponding ministries in some countries (e.g., Portugal, Spain), in others, the fear that these may undermine full programs is dominant in the higher education policy debate (e.g., Greece). In Portugal, micro-credentials are even supported financially by the national government.

Another framework condition that differs enormously between countries but affects the approach to the topic to a great extent is that of legal requirements. For instance, only Germany has such strict legal requirements for university-based continuing education programs. In other partner countries, universities are relatively free when it comes to the design and issuance of micro-credentials.

Interestingly, the general acceptance of micro-credentials within the respective countries as well as in societies is rated low everywhere, even though all of the partners expect that awareness and acceptance will increase massively within the next few years.

5. Conclusion

The results of the survey clearly show that all participating European institutions are dealing with the issue of short, flexible tailored learning opportunities (some of them already for several years), although there is still no single European approach to micro-credentials. It is evident that all have different approaches, at both the institutional and national level, with institutional policies reflecting the national approach. Even though there are some commonalities, as described above, the differences are very striking.

In its adoption of the Council's recommendation, the EU says, that the newly examined text "now meets with the agreement of all delegations" (s. EC 2022a). If it is the case that all European delegations agree on the recommendation, having the support of their national ministries would be one – if not the central – building block for all those institutions offering or planning to offer micro-credentials. It would also help to overcome another challenging issue: awareness and acceptance, which seems to be low in all the surveyed countries. In some countries, the idea of micro-credentials seems to be very welcome and universities are supported and encouraged to develop new offerings. In other countries, there is a clear hesitation at the political level. While the EU highlights a number of benefits in relation to micro-credentials, many risks are discussed at national level in some states. In order to make micro-credentials a European success story and to cover the needs of "learners, workers and job-seekers seeking to upskill and reskill, [... who] wish to ensure their employability and career progression" (EC 2021b), member states need to find a consensus on the benefits of micro-credentials and communicate them as such.

Another challenge seems to be the wide range of micro-credentials on offer and the differences that relate to some of the most important aspects, not least the size and cost of micro-credentials. The European Commission itself admits:

> To date, there is no common definition of micro-credentials and there is a lack of standards to describe and recognise them. This causes concerns about their value, quality, recognition, transparency and 'portability' (portability between and within education and training sectors, portability on the labour market and portability across countries). This limits the trust, understanding, wider acceptance and uptake which in turn limits the potential of micro-credentials to support flexible learning and career pathways. (EC 2021b)

This corresponds with the results of the survey. It is becoming apparent that, within Europe and at a national level, there is an urgent need for a more detailed definition of micro-credentials. Clear parameters would also facilitate aspects like permeability and stackability not only within national institutions but also within Europe. Distinct criteria regarding the term "micro-credential" will also be necessary, since the results of the survey show that many institutions already seem to offer micro-credentials but are using different terms for certification. These discussions and national approaches also appear to reflect a number of specific issues that are characteristic for certain countries. In Germany, for example, the issue of permeability between professional and academic career paths is an ongoing topic, which should also be considered in the context of micro-credentials. This also holds true for quality assurance, that every country already seems to be implementing but only on a national scale. If there are explicit and common guidelines on micro-credentials at a European level, universal recognition could be assured.

Most of the micro-credentials in our survey are focused on specific national requirements, are offered in a national language, and with differing emphases (i.e., intensifying contact to the labor market, facilitating student transition, etc.). It is therefore still open to debate as to whether micro-credentials can become a

standard for bi- or multinational certificates and enable corresponding degrees. However, there is still a chance that micro-credentials can become a transparent standard in university – but also in vocational – education, and thereby would be a great benefit to all learners within the European higher education landscape as well as in the field of vocational training. They also might "be used in targeted ways to address challenges within [...] labour markets, including gender and other discriminatory stereotypes (e.g. concerning study choices and within education practices and materials), to support smoother school-to-work transitions" (EC 2021b). However, this requires binding quality assurance and a more precise definition than the EU has provided so far.

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The changing Labour Market and the role of the micro-credentials in LLL and VET (Vocational Education &Training)

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Abstract

The speech deals with the ongoing transformation in the Labour Market (including the effects of the "mega- trends", such as digitalization) and the role of Training, as active employment policy, emphasizing the dynamics of micro- credentials. Initially, it provides an overview of the dominant trends in the Labour Market (including the rising of the various forms of precarious work, among Youth and its association with the social vulnerability). Then, it proceeds in briefly (critically) examining the projections- forecasting on future skills and future jobs. Given the abovementioned, emphasis is laid on the state-of-play regarding Training, and LLL, within this (rapidly) changing context, while the presentation analyses the role of the micro-credentials in Reskilling, (flexibly) building individual skills-repertoire and feed-backing the existing accreditation- certification practices and patterns.

Key words: Labour Market, Mega Trends, Precarious Work, Micro-credentials, Reskilling, social inclusion, employability.

1. Introduction: The Changing Labour Market

Historically the rate of youth unemployment is higher, double or more than double, than the totally unemployment rate. The onset of the economic downturn resulted in a dramatic increase in the rates of youth unemployment, culminating in the years 2009-2013, as shown in the diagram below, reflecting the difficulties and obstacles that young people face in finding jobs and getting integrated in the labour market. Diagram 1 clearly shows the change in youth unemployment rates in the European Union from 2000 to 2015, and, in particular, the sharp increase in the rate from the onset of the financial crisis (2008) until 2013 (Eurostat, 2015: http://ec.europa.eu/eurostat/statistics-explained/indexphp/Unemployment_statistics) (see Figure 1).

Figure 1: Youth unemployment rates, EU-28 & EA-19, seasonally adjusted, January 2000 - March 2015 (%)
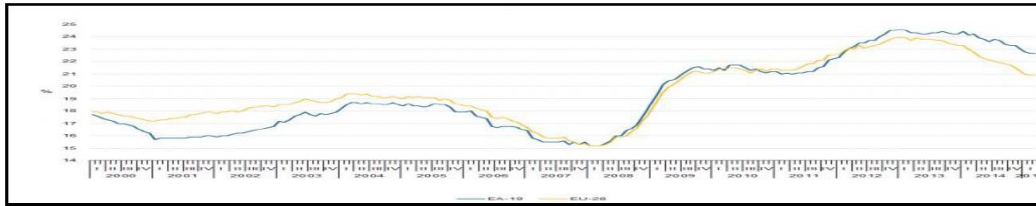
Source: Eurostat (une_rt_m) as cited in Eurostat, 2015: http://ec.europa.eu/eurostat/statistics-explained/index.php/Unemployment_statistics.

In the aftermath of the Crisis, in December 2018, the youth unemployment rate in the EU28 has dropped to 14,9% (Men: 15,5%, Women: 14,1%- see Eurostat, 2019a), namely scaled back by 4,9% since September 2015 (20%) (see Eurostat 2016). The decrease of youth unemployment, especially comparing to its historical high in April 2013 (23.8%- see Eurostat 2014), even relieving, cannot hold back the increasing asymmetries among the M-S.

However, the pandemic Crisis has affected the labour market and subsequently the youth unemployment increased in the EU and reached 16.2% in 2020 (men: 15.9% & women: 16.5% / Eurostat, 2021g; Eurostat, 2021j). In Greece is has increased up to 37.6% (men: 36.6% & women: 38.9% / Eurostat, 2021g; Eurostat, 2021j), more than double than the also increased youth unemployment in the EU. It was the highest youth unemployment rate in the EU-27 (Eurostat, 2021g).).

It should be noted that the unemployment rates differ significantly across Europe, while in the Southern Countries the total unemployment remains more than the double comparing to the EU average (see Figure 2).

Figure 2: Unemployment rates across Europe (in %, February 2017)
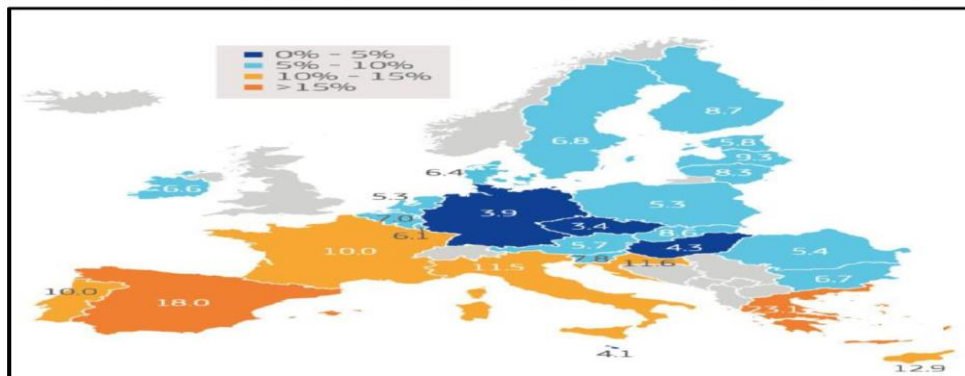
Source: European Commission, 2017b: 10.

Another critical issue that substantially affects young people's life chances and life courses is the over-representation of long-term unemployment among youth. The long-term youth unemployment rate in the EU "*increased considerably, from 23% in 2008 to around 30% in 2016, meaning that almost one-third of unemployed young people have been looking for a job for 12 months or more without success. As the data show, of these, the majority have been out of work for more than two years, illustrating the risk of job-seekers becoming trapped in protracted spells of unemployment. The extent of long-term youth unemployment varies considerably across Member States, with the highest rates recorded in Greece (53%), Italy (52%) and Slovakia (47%), while the lowest rates are found in all countries with very*

well-developed policy interventions, including well-functioning Youth Guarantee schemes, such as Denmark (8%), Finland (7%) and Sweden (5%) (Eurofound 2017: 3).

 It should be mentioned at this point that there is a strong association between educational attainment and social outcomes including the risk of poverty and/ or social exclusion (see European Commission 2017a: 9). According to the European Commission, "*the overall number of low-qualified adults has been falling with each younger cohort. For example, in 2017 around 4.6 million young adults aged 20-24 did not possess at least a medium-level qualification, compared with 10.2 million adults aged 60-64. However, the relative decline — i.e. the decline of the share of low-qualified among the total population in the appropriate cohort — has been very slow for the four youngest cohorts in the labour market*" (European Commission 2018: 70).

Additionally it should be noted that clearly the younger people and especially the ones with less qualifications and skills face enormous difficulties to be integrated in the changing labour market. As Andy Green (2017: 7) points out, "*the 2007/2008 financial crisis and the ensuing recession and austerity dramatized the situation of young people because they were the age group which was hardest hit in terms of rising unemployment and declining real wages*" (see also Figures 3 & 4).

Figure 4: Rates of "at-risk-of-poverty or social exclusion" of people aged 18 and over by level educational attainment level, EU-28, 2015
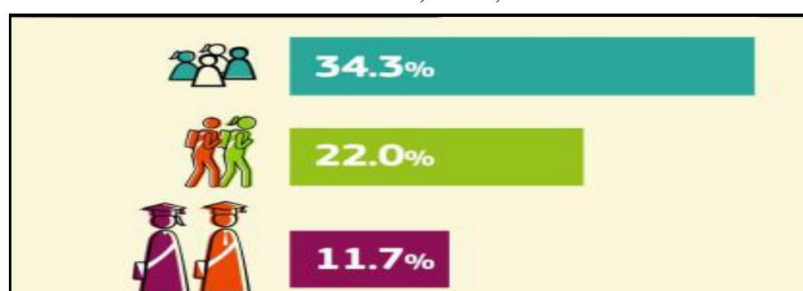
Source: Eurostat, EU SILC, 2015 as cited in European Commission, 2017a: 10.

The employment rates of recent graduates target continues to recover from the 2008 crisis and have improved slightly since the previous year, standing in 2020 at 80,9%, higher than the 78,2% in 2016 and close to the benchmark of 82% in 2020 (European Commission, 2020: 66). The employment rates of recent graduates was, in 2017, *"84.9 % for tertiary graduates, 76.6 % for those with upper-secondary or post-secondary vocational qualification and 64.1% for those with a general upper-secondary qualification"* (European Commission 2018: 56). The abovementioned highlight the role of the qualifications and skills in the integration in the labour market. Indeed "*the differences between the types of graduates are substantial….. (while) the mismatch remains high, particularly among bachelor's diploma holders"* (European Commission 2017a: 12- 13) (see Figure 5).

Further, it should be noted at this point that there are major differences between the Member States in terms of the employment rates of recent graduates, since youth unemployment remains remarkably high in Southern Countries, heavily affected by the Crisis and the Recession, such as Greece, Spain and Italy (see Papadakis, Drakaki, Kyridis, Papergirls 2017: 8- 10 and analytically European Commission 2018: 56).

Figure 5: Mismatch between the educational attainment and the occupation, 2016

Legend: the shares of people (aged 25-44) with a tertiary (top), a bachelor (middle) and a master diploma (bottom) that have an occupation traditionally requiring a lower level of educational attainment.
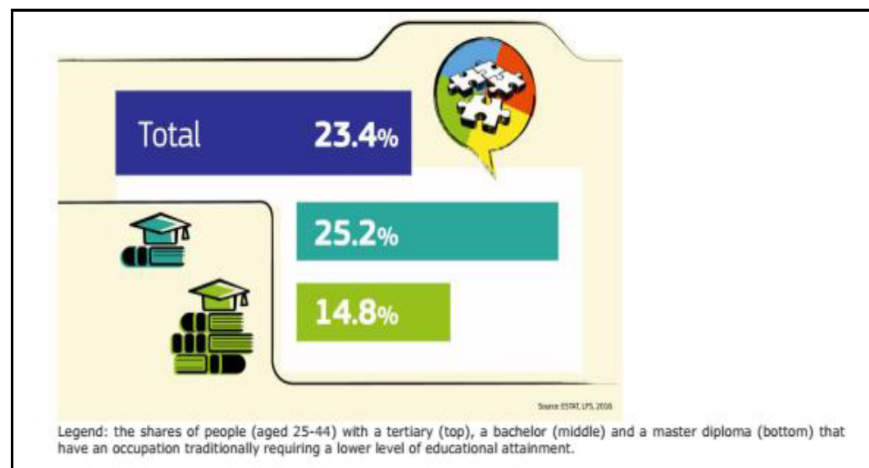
Source: ELSTAT, LFS, 2016 as cite in European Commission 2017a: 13.

## 2. Mega-Trends, Precarious Work Rising and Key Challenges in the EU

Unemployment, youth unemployment, poverty and their persisting correlation constitute, probably, one of the major challenges in the EU, at the moment.

According to the Euro-barometer, more than 8 out of 10 Europeans consider unemployment, social inequalities and migration the top challenges, that the EU is facing, while more than the half of the Europeans consider that not everyone has chances to succeed, and life chances would be more limited for the young-next generation (see Eurobarometer, 2017, as cited in European Commission, 2017a: 20). Further, according to the European Commission, unemployment rates "*are falling (constantly since 2014) but differ substantially across Europe….(while) the crisis has affected parts of Europe in different ways, but across the Union, it is younger generations that have been hit particularly hard*" (European Commission, 2017a: 9). It seems, that precarious work gradually becomes *"the new norm to which employment and social protection systems must adjust but the motivators for, and likely consequences of, legitimising and normalising these employment forms are complex and potentially contradictory. Precarious work is best defined as the absence of those aspects of the Standard Employment Relationship (SER) that support the decommodification of labour*" (Rubery, Grimshaw, Keizer, & Johnson 2018: 511).

In the last decade (2010-2020), there has been an increasing intensification of policy interventions, at the European level, aiming at reducing precarious work and protecting and, further, improving working conditions (Eurofound, 2020: 3-4). The above mentioned intensification is due on the one hand to the impact of the multidimensional economic Recession on employment and labour market, and on the other hand due to Mega-Trends that are taking place and seem to gradually prevail (e.g. globalization, digital economy, digitalization, demographic and social changes, climate change, etc.) (Eurofound, 2020: 3-4). These Mega-Trends had a clear impact on the structure of economy and labour market, industrial relations systems, and business models, having, in turn, direct impact on work relations, forms of employment and contracts types and, consequently, on social welfare systems in Europe (Eurofound, 2020: 3-4) (see Figure 6).

Figure 6: Relationship between megatrends, effects and impacts on the labour market, and policy interventions
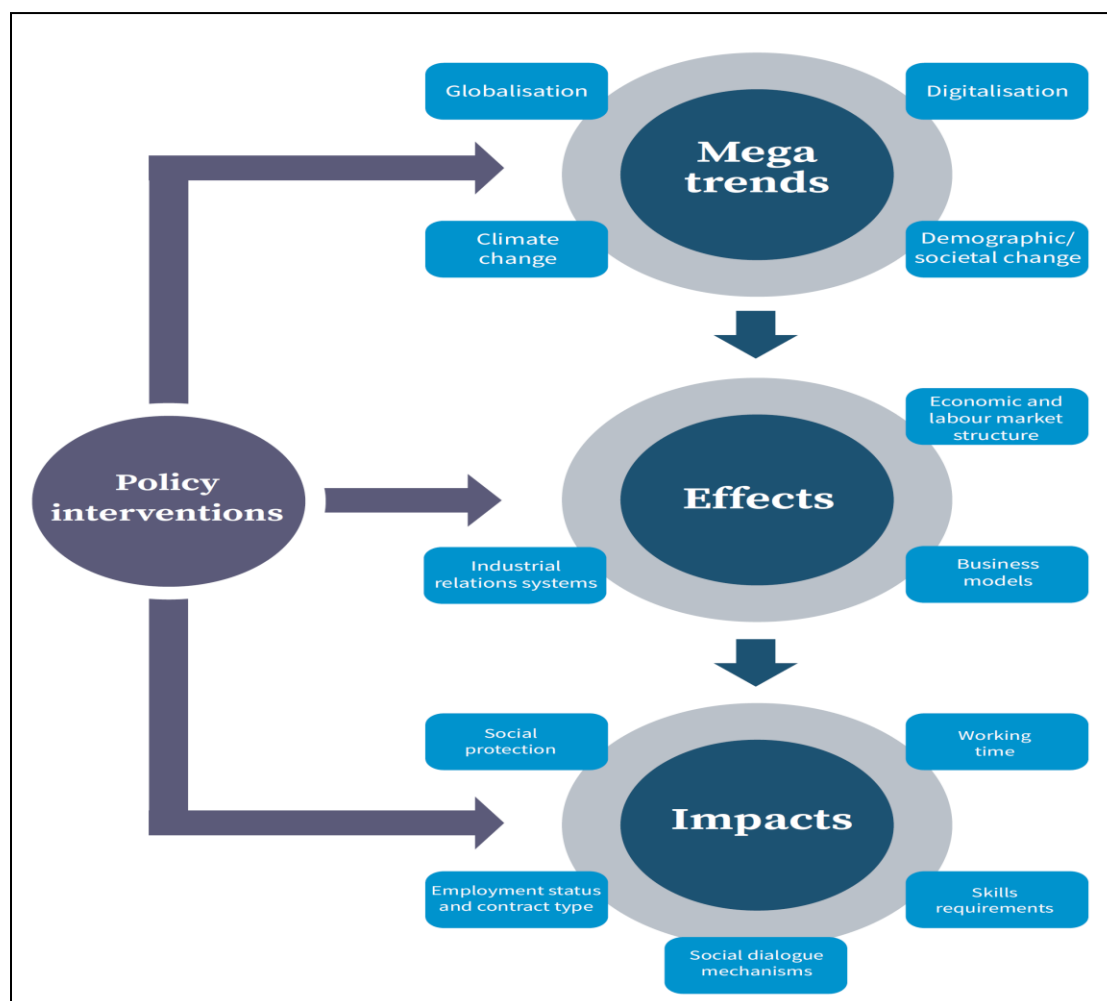
Source: Eurofound, 2020: 4.

Within this context, "Eurofound has recorded and highlighted seven phenomena-emerging transformations in the area of the European labour market, namely i. Flexibilisation, ii. Part-time work, iii. Temporary contracts, iv. Self-employment, v. Polarization, vi. New business models and vii. Rising insecurity. Furthermore, Eurofound has pointed out that the COVID-19 crisis has increased potential employment risks for workers with precarious contracts (Eurofound, 2020c). The abovementioned result in seven key-challenges for the future of labour in the EU, that are directly or indirectly associated with the intensity and extent of precarious work in Europe (Eurofound, 2020a)" (Papadakis at al 2022: 2).

During the decade 2008-2018 (Eurofound 2020) the rates of part-time employment in all its types (permanent, fixed-term, self-employed) increased in most EU countries (see Papadakis et al 2021: 31).

According to the Eurostat (2020i), in 2020, part-time workers in the EU28 were twice the risk of poverty than those employed full-time. Moreover, during the years 2010-2018 the poverty risk rates (Eurostat, 2020c) recorded in part-time employment, were consistently

higher for workers aged 16-24 than for those aged 25-54, with differences ranging from 1.6 to 3.3 percentage points. During the years 2010-2018, the risk of poverty in temporary employment increased considerably in the majority of EU28 countries (Eurostat, 2020a-2020d). The risk was almost three times higher for employees with temporary jobs, than for those with permanent jobs (Eurostat, 2020i).

Figure 7: EU28 Member States, 2018   In-work at-risk-of-poverty rate by type of contract
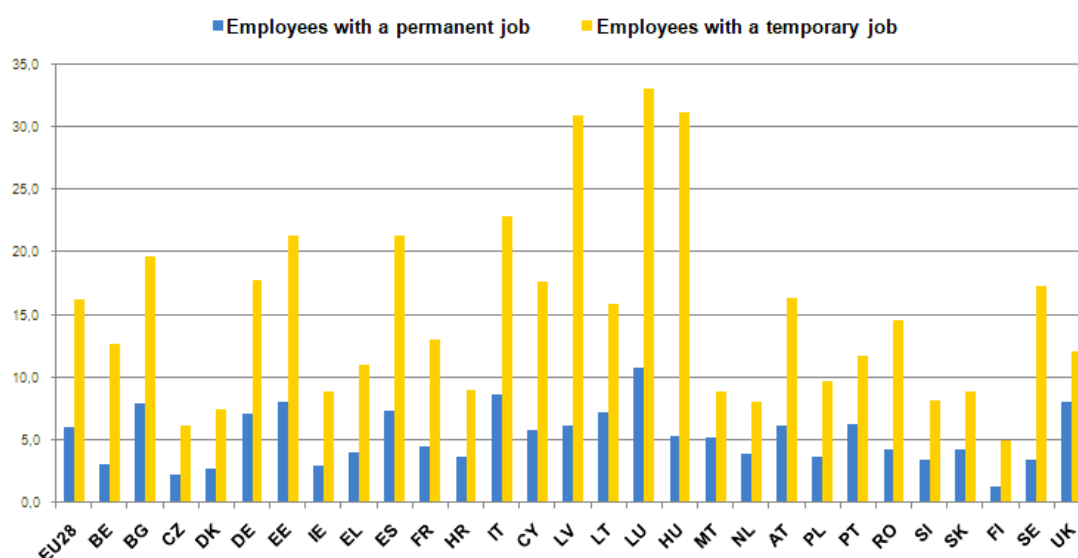
Source: Eurostat, 2020i.

In all EU28 countries (Eurostat, 2020f), the proportion of employees in temporary employment recorded in 2019 was much higher for young people (Eurostat, 2020g).. As reported by Eurostat (2020j), in the second quarter of 2019, almost half (42.8%) of employees aged 15-24 were employed under a temporary contract More specifically, the share of such contracts for employees aged 15-24 was more than three times higher than that for employees aged 20-64 (EU28: 42.6% for the age group 15-24 *vs*. 12.6% for the age group 20-64). In 9 out of the 28 EU countries, more than half of the employees aged 15-24 worked on a temporary basis in 2020 (Eurostat, 2020j).

Over the years 2010-2018, temporary workers were constantly at almost triple the risk of poverty than permanent workers (Eurostat, 2020e; Papadakis et al., 2020). It becomes clear that "there is a clear correlation between precarious work (part-time and temporary) with social vulnerability and poverty, which is higher for medium and low-skilled young people, who are over-presented in the precarious work rates" (Papadakis et al 2022: 6)

3. On the impact of COVID-19 and resulting Recession pandemic in labour market in EU and Greece

In its Labour Force Survey (LFS), Eurostat (2021b) investigates labour market slack and the effects of the COVID-19 crisis, both at EU27 level and nationally in the respective member states for the extended labour force, which includes: (a) the unemployed, (b) the part-time underemployed and (c) the potential workforce. The labour market slack has clearly increased, all across EU, during the pandemic (see analytically Papadakis et al, 2021: 36), while there was also a remarkable increase regarding the Neets' percentage in several EU M-S (see Eurostat, 2021h). Figure 8 (Eurostat, 2021b) depicts the fluctuation of the labour market slack as regards young people aged 15-24 of the extended workforce, for the years 2019 and 2020 in Greece and the EU27 (on a quarterly basis). It is obvious that during 2019 and 2020, the rates of labour market slack in Greece were much higher than those of the EU27 average. In all three quarters of 2020, Greece was among the countries with the highest rates of labour market slack (49.4% in the first quarter, 50.2% in the second quarter and 48.2% in the third quarter). It should be noted here that for the young people, during the Q1 2021, the labor market slack stood up to 55,4%, the highest percentage among the EU27 M-S (Eurostat, 2021b).

Figure 8: Greece and EU27, first quarter of 2019 - third quarter of 2020 Age group: 15-24 of the extended workforce Labour market slack (%),
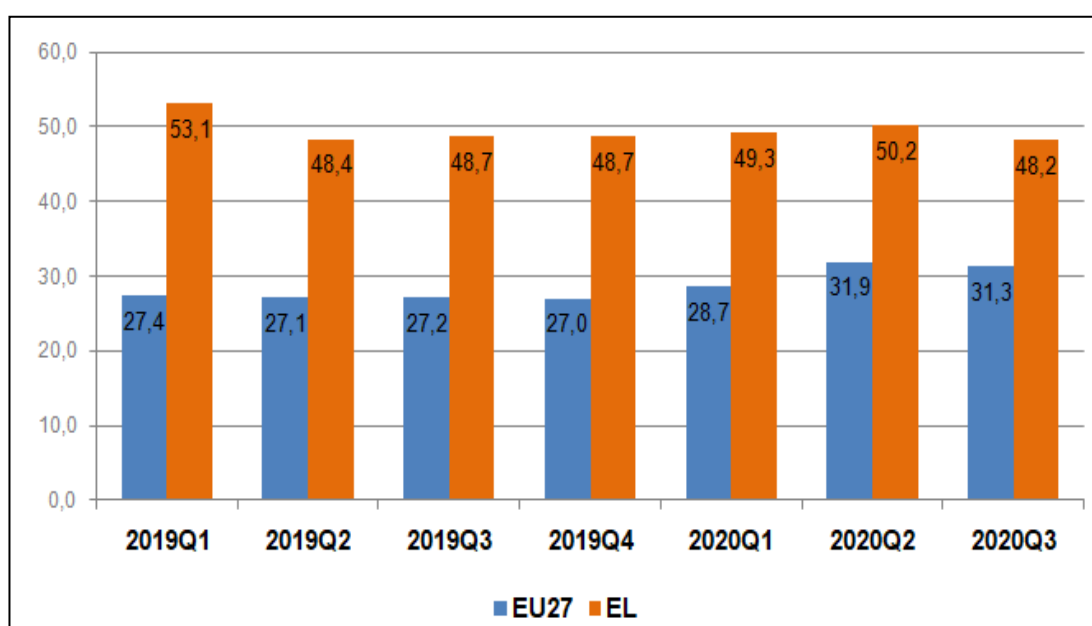
Source: Eurostat, 2021b

4. The role of Micro-Credentials

4.1. 1. Preliminary Remarks and definitional issues

Increasingly rapid advances in technology and the labour market require graduates and professionals in the workforce to be familiar with state-of-the-art knowledge, and to possess the skills and competences needed to make full use of technological and non-technological know-how. Within this context, the role of micro-credentials is of vital importance (see European Commission 2022).

It's true that there are diverse definitions and a common definition and approach on their validation and recognition is lacking. This causes concerns about their value, quality, recognition, transparency and 'portability' (portability between and within education and training sectors, portability on the labour market and portability across countries) (European Commission 2021: 2).

According to the European Commission: "*Micro-credentials certify the learning outcomes of short-term learning experiences, for example a short course or training. They offer a flexible, targeted way to help people develop the knowledge, skills and competences they need for their personal and professional development*" (European Commission 2022).

In any case, it becomes clear the need for 'just-in-time' skills development that is immediately applicable. Given that, the role of micro-credentials to widen learning opportunities and pathways and strengthen the role of higher education and vocational education and training (VET) institutions in promoting lifelong learning by providing more flexible and modular learning opportunities, becomes gradually accepted.

Micro-credentials have a clear existing or potential contribution to reskilling and upskilling through more flexible alternatives and learning pathways than a full degree. Thus, the Commission aims to have all the necessary steps in place by 2025 for their wider use, portability and recognition.

4.2. EU Initiatives towards micro-credentials

The European Commission has proposed "*a strategy to help people develop skills in a rapidly changing labour market and announced a new initiative on micro-credentials in the European Skills Agenda (July 2020). In the Communication on achieving a European Education Area by 2025 (September 2020), the Commission announced a proposal for a Council recommendation to support building trust in micro-credentials across Europe. The Communication said that the recommendation would aim to ensure all the necessary steps for micro-credentials were in place by 2025. An action on a European approach to micro-credentials is therefore included in the Commission's 2021 Work Programme under the headline ambition "Promoting our European way of life". The proposal for a Council Recommendation on micro-credentials is presented together with the Commission proposal for a Council Recommendation on Individual Learning Accounts*" (European Commission 2021: 1-2).

The overall aim is for micro-credentials "*to be developed, used and compared in a coherent way among Member States, stakeholders, and the different providers (from education and training institutions to private companies) across different sectors, fields and countries. The (European Commission's) proposal aims to support the ongoing work on micro-credentials by Member States, stakeholders and diverse groups of providers across the EU*" (European Commission 2021: 3).

Given their importance, Micro-credentials also feature in the [European Pillar of Social Rights Action Plan](#) (March 2021) and the [Commission Communication on achieving the European Education Area by 2025](#) (September 2020).

On 16 June 2022, the Council of the European Union (EU) adopted a [Recommendation on a European approach to micro-credentials for lifelong learning and employability](#), that is anticipated to lead the way towards a truly joint and functional European perspective on micro-credentials.

4.3. Key Goals

Key goals, of a holistic approach to micro-credentials and their role in a changing labour market, include:

- *Association with LLL and increase of participation in training*. The EC anticipates that Micro-credentials "will also play a key role in helping to achieve the 2030 target of 60% of all adults participating in training every year" (European Commission, 2021: 3).

- *Increasing the employability of workers, via the expansion of short training courses, mainly those certified by micro-credentials*,

- *Strengthening the role of Higher Education and its association to Society at Large*: In its Resolution of 18 February 2021 on "a strategic framework for European cooperation in education and training towards the European Education Area and beyond (2021-2030)" the Council calls for: "*strengthening the key role of higher education and VET systems in supporting lifelong learning and reaching out to a more diverse student body. Exploring the concept and use of micro-credentials can help widen learning opportunities and could strengthen the role of higher education and VET in lifelong learning by providing more flexible and modular learning opportunities, and offering more inclusive learning paths*". (European Commission 2021: 4). Indeed, "*'higher education […] can also further engage adults, promote upskilling and reskilling, and play a role in lifelong learning through flexible alternatives to full programmes, by exploring the concept and use of a European approach to micro-credentials*" (European Commission, 2021: 4).

Within the framework of the development of the Bologna Process and the European Higher Education Area, joint indicators were developed aiming at reflecting the learning outcomes (knowledge-skills- competences) and the qualifications (such as the Diploma Supplement) of the students and graduates (see Conference of Ministers responsible for Higher Education, 2003) and subsequently increasing visibility and accountability all across Europe (see Zgaga

2007: 36-37). What is really important here is the specific role accredited to higher education. Higher Education is perceived as a prime mover towards the enhancement of human capital, able to change the role of Europe in the world competitive economic arena (Lavdas, Papadakis, Gidarakou 2006: 136). Together with the new reality of reformed structures and the political trend that enhances the role of regional and local authorities as the units that can promote economic development and sustainability (Peters 2007: 133 and OECD 2014), a third task for the Higher Educational Institutes can be recognized. This task is "the reinforcement of the economic, social and cultural development of regions and cities, in the context of the connection of Higher Education with the so- called "Society at Large" (see Nikolaou & Papadakis 2003: 5)" (Papadakis & Drakaki 2021: 107).

Within this context, a new benchmark was added since 2012 in the EU2020 Strategy (which was linked to the Bologna Process), namely the benchmark "Employment rate of recent graduates" (European Commission 2018: 4). It highlights the emphasis that the EU lays on the harmonization of education (including Higher Education) to employment and the labour market. In fact, this precise target has almost been achieved at the European level, but just for the high skilled (see Papadakis & Drakaki 2021: 108).

Higher Education has a potential role to play for the social inclusion of the low- and medium-skilled and the micro-credential can lead the way to such an inclusive approach.

5. Key Challenges & Conclusions

The above-mentioned raise several key key-challenges:

✓ *Tackling with social vulnerability and increasing socio-economic inequalities (including digital inequalities)*, by providing to socially vulnerable groups flexible and recognized ways (micro-credentials as 'small volumes of learning' instead of 'short learning experiences' – see EC 2021: 7- visible in the labour market) in order to increase their employability and subsequently social inclusion. Inequality is widely regarded as a threat to social cohesion and the long-term prosperity of EU societies (see European Commision 2017b: 9 and Wilkinson & Pickett 2010). It should be noted at this point, that a major deficit (so far) in the LLL is the under-representation of socially vulnerable groups and low skilled (Papadakis 2022), which is still visible and remains a challenge. As European Commission points out in 2018, low-skilled adults, -who need more than anyone else the access to learning,- participated the least in learning, while the age group of adults aged 25-34 are almost three times more likely to participate in learning than adults aged 55-64 (see in detail European Commission, 2019: 71-73).

✓ *Recognition and accreditation, that enhance portability and involves quality assurance mechanisms*. In terms of VET, ECVET is a feasible pathway. When it comes to Higher Education, micro-credentials potential correspondence to ECTS (based on learning outcomes and level descriptors) could be achievable, via the relevant institutional arrangements. It should be noted that "*in the Council conclusions on the European universities initiative, the Council invites the Commission and the Member States to 'jointly explore the necessary steps to enable to test the use of micro-*

credentials in higher education in order to help widen learning opportunities and to strengthen the role of higher education institutions in lifelong learning" (European Commission, 2021: 4).

Further, it should be noted that aiming at facilitating the transfer and use of qualifications across different countries and education and training systems, the European MOOC platforms (including EADTU) has launched a Microcredential framework {Common Microcredential Framework (CMF)} which is viable and well- documented. The above-mentioned framework "*fits into the European Qualification Framework for Lifelong Learning, which combines learning outcomes in higher education and in professional training. The CMF indicates the size of a MOOC program in terms of workload (the Standard entails 4-6 ECTS / 100 to 150 hours of study time) and level (level 6-8 in the EFQ, bachelor, master and third cycle level)….. while it provides the option for Level 5, in combination with ECTS)*" (EMC 2022).

Within the above-mentioned context of initiatives, skates and challenges, the enhancement of the involvement of stakeholders (i.e the ones involved in the context of the European Qualifications Framework Advisory Group) and social partners in the whole framework of planning and implementation of micro-credentials becomes conditio sine qua non.

Despite the diverse existing definitions and forms- schemes and given that micro-credentials complement the existing national processes in organizing education and training, employment, or labour markets, an actual joint European approach, based on the Council of the European Union Recommendation on a European approach to micro-credentials for lifelong learning and employability, is of vital importance,

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"What have micro-credentials done for me lately?" Reorienting discourses and action for social value.

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Abstract

Micro-credentials are a topic of growing international interest (McGreal and Olcott, 2022), and have been positioned in recent popular discourse as a potentially-transformative means of generating new economic and social value for 21st century learners (for a review, see Brown et al., 2021). Across the globe, governments, higher education institutions (HEIs) and corporate actors have argued for the provision of more flexible learning experiences, where individuals and organisations have greater autonomy to choose shorter, targeted forms of certified learning. The justification for such provision is generally framed in human capital theory with narratives of upskilling and reskilling, along with developing agile, lifelong competencies of individuals.

This brief paper critically examines the literature, questioning whether an economically-instrumental, demands-based emphasis described in several recent governmental and policy documents is a coherent and sustainable direction of travel for micro-credentials, in an era of disruption and upheaval. Tensions are highlighted between i) a focus on industry-aligned, co-constructed learning, on the one hand, and ii) wider social and humanistic value, which generally underpin educational conceptualisation of human development, on the other. The former raises questions and ambiguities regarding i) the role of HEIs within a wider micro-credential ecology, ii) the appropriate role for industry in HEI-designed/administered micro-credential provision, and iii) whether and how micro-credentials can demonstrate tangible additional value likely to attract industry partnerships, particularly within established programmes and modules.

Critiquing national and international initiatives with micro-credentials at their core the need for a sharper focus on social, civic, and collective objectives in micro-credential strategy is identified. It is argued these aspects are generally nascent, despite the rhetoric of using micro-credentials to further social and ecological challenges ranging from intercultural communication and social development to mitigation of climate change. These priorities are not representations of individualised transversal competencies or skills but of 21st century social necessities for a planet changing beyond recognition at an alarming and unprecedented pace (IPCC, 2022). The

challenges raised by these realities speak to a need for critical, engaged learners who are agile, but more fundamentally, active, informed global citizens, with the ability to shape their collective futures, across personal, professional and social domains (Sala et al., 2020). Excessive focus on micro-credentials for professional development or upskilling risks limiting the scope of these possibilities. In summary, it is argued that current approaches to micro-credential provision should move beyond simplistic binaries of micro-credentials as either tonic or threat towards wider applications to further social value and good and collaboration towards social participation and inclusion.

Keywords: micro-credentials, social value, flexible learning, inclusivity

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European Universities Initiative and University Networks

Infusing dIgital entrepreneurial skills for university education: The case of INFUSSE

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For many students, the semester close to graduation is an exciting time filled with internships, job interviews, travel and seeking new entrepreneurial endeavors. But Covid-19 has been hit these young entrepreneurs-in-the-making the most. To build new competencies, they must rapidly learn new skills and mindsets in an era where resources are difficult to maintain. HEIs are called to adapt and evolve, utilizing digital technologies and tools to develop strategies and actions to respond to the Covid-19 impact, offering equal opportunities among students without the much-needed digital skills. The emphasis on the development of digital and entrepreneurial competencies can play a major role in impacting students' development and ensure ongoing support for purpose-driven entrepreneurs. Educators also need to adapt their training programs and material to the new normal of fully digital education and acquire technical competencies to be able to manage a virtual classroom but also develop entrepreneurial thinking qualifications that will keep the students engaged in their lessons and help them understand the knowledge that they would like to transfer to them.

In the face of recovery, several opportunities arise and HEIs should prioritize the human factor when managing a crisis. Through the deployment of the Erasmus + Program INFUSSE, we aim to provide essential coaching and mentoring services to help aspiring digital young entrepreneurs navigate these uncertain times and make them feel part of their community. It will leverage new tools for online supporting business opportunities, making business models resilient; enhancing the capacities of both educators and students.

The main goal is to support the digital entrepreneurship education uptake in HEIs, through an innovative learning methodology based on competency-based logic and emphasizing authentic learning situations. We will deploy an innovative pedagogical methodology, designed to support both Educators and Learners to develop digital and entrepreneurial competencies in three competence areas, as suggested by DigComp 2.0 and EntreComp EU Frameworks: Ideas & Opportunities, Resources and Into Action.

INFUSSE Virtual Incubation Program with its two pillars: the national and transnational one, enables participants to collaborate, and grow their co-creation spirit in seeking new digital business ideas tackling joint challenges. The participants will live authentic learning experiences resulting from the COVID-19 reality during and after the pandemic, acquiring skills that allow them to adapt to virtual environments, as well as leveraging digital entrepreneurial skills to develop state-of-the-art digital solutions. This specific approach will promote the development of transversal skills, risk-taking culture, creativity, co-creation and

open innovative thinking and provide a high added value to the initial training of learners as well as educators, beyond specific technical and disciplinary knowledge and competencies.

INFUSSE will ensure equitable access to an inclusive learning environment and a high-quality educational experience through its educational HUB, allowing end-users to customize pillars, modules, and tools according to their specific needs and projects. Finally, it will deploy a learning methodology to stimulate virtual cooperation and transnational teams' formulation towards co-creation and co-development of digital solutions to solve a joint challenge: mitigating the impact of the Covid-19 crisis by leveraging digital entrepreneurial skills.

Internationalisation and Virtual Mobility

Creating a Cross-Institutional Virtual Exchange Experience for Higher Education Students

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Abstract

The Covid-19 pandemic presented higher education institutions with the challenges of suddenly having to switch to online and hybrid teaching and dealing with the initial collapse of physical student and teaching mobility. In the Erasmus+ project **VERSATILE – Virtual Education Readiness Semester – Adaptive Toolbox for an International Learning Experience,** four European higher education institutions are creating the necessary building blocks for a collaborative online semester abroad in the form of a guide to online teaching methods, a model curriculum of team-taught modules in the social sciences and guidelines for an administrative infrastructure. It enables deeper collaboration between the project partners and provides other higher education institutions with guidelines to develop online collaborative learning and teaching environments.

VERSATILE has four key objectives: 1) to create viable alternatives to physical student mobility during the pandemic, 2) beyond the pandemic to enable higher education institutions to offer new internationalisation-at-home possibilities to students who traditionally face mobility barriers, 3) to aid educators in developing their online teaching skills, and 4) to provide new ways in which educators can internationally exchange knowledge and methods.

The four universities of the VERSATILE strategic partnership are the lead partner Rhine-Waal University of Applied Sciences (HSRW, Germany), Tampere University of Applied Sciences (TAMK, Finland), University of Derby (UoD, UK), and the University of Masaryk (MUNI, the Czech Republic). Central to the collaboration of the four universities is the creation of a collaborative online semester abroad – a virtual exchange experience, which will be underpinned by the three intellectual outputs:

- Online Teaching Guide, including a Toolbox for hybrid education
- Joint curriculum of modules and
- Guidelines for developing a common administrative infrastructure for an online semester.

These outputs serve as the basis for intensifying collaboration within the international network to which the project partners belong, at the same time as providing tools and guidelines that other higher education institutions can use and learn from in developing their own online international collaboration.

VERSATILE will produce results that can be used by the project partners and other higher education institutions. These results can be extended to include further partners and other disciplines. The intellectual

outputs provide other higher education institutions with the key building blocks necessary for developing and delivering a collaborate online semester abroad.

Keywords: education, teaching, learning, hybrid, online, collaborative, virtual, cross-institutional, exchange, student administration

1. Introduction

During the Covid-19 pandemic higher education institutions were not only confronted with the challenge of implementing online and hybrid teaching but many also faced a complete interruption of internationalization activities within their study programs. Many higher education institutions had implemented internationalization elements in different forms (e.g. mobility windows, summer schools, international weeks etc.) as an integral part of curricula and were hence required to create replacement offers for students and teaching staff. As an immediate response many institutions allowed students to supplement physical mobility with virtual/online mobility activities offered by partner institutions once students were nominated for an exchange. As a further quick measure, a network of institutions (The Hague Network) created "The Hague Virtual Exchange Semester" allowing students to virtually participate in courses offered by the member institutions and to receive ECTS for these courses. This program was initiated as a quick response out of "The Hague Network", a network of institutions founded by The Hague University of Applied Sciences that share a common commitment to internationalization. Building on the experience of this low-level exchange program as well as prior cooperation in the "The Hague Network", four institutions out of the network initiated a strategic partnership project and applied for EU funding. The project VERSATILE (Virtual Education Readiness Semester – Adaptive Toolbox for an International Learning Experience) is developed by the lead partner Rhine-Waal University of Applied Sciences (HSRW, Germany) jointly with Tampere University of Applied Sciences (TAMK, Finland), University of Derby (UoD, UK), and the University of Masaryk (MUNI, the Czech Republic). The aim of the project is to build on the experiences of the existing virtual exchange program of "The Hague Network" and to expand this program utilizing the different strengths of the partner institutions to address the difficulties that were encountered by the participating institutions and especially by their students. Within the initial virtual exchange program, participating institutions were able to open their own online courses for students from partner institutions. This allowed students to choose courses from a vast course offer from different institutions. However, at the same time several administrative and academic challenges occurred. Especially differing enrolment requirements, different semester times as well as the use of different learning platforms posed significant problems. Furthermore, differing course formats, teaching styles and online teaching tools proved to be a challenge for the students and hence also for the success for the program.

In order to address these challenges, the partners of the VERSATILE project have chosen to develop a collaborative online semester abroad for the spring term 2023. In order to underpin this activity, three intellectual outputs are being produced: a guide for online teaching methods, guidelines for developing a common administrative infrastructure for an online semester as well as a joint curriculum of team-taught modules. These guidelines are intended to facilitate the offering of an online semester abroad by offering recommendations on how to tackle administrative obstacles especially when more than two partners are involved and how to cope with the challenges of an international class-room in an online setting. These guidelines are intended to enable higher education institutions to achieve four objectives:

1. To create viable alternatives to physical student mobility during the pandemic.

2. Beyond the pandemic, to enable higher education institutions to offer new internationalization-at-home possibilities to students who traditionally face mobility barriers.
3. To aid educators in developing their online teaching skills
4. To provide new ways in which educators can internationally exchange knowledge and methods.

2. Considerations on terminology

The VERSATILE higher education partnership is built on the solid basis of offering a transnational, cross-institutional virtual exchange option for students. The definition of **virtual exchange,** as presented by EU Erasmus+ programme, is very feasible for the purposes of the VERSATILE partners:

"Virtual exchanges projects consist of online people-to-people activities that promote intercultural dialogue and soft skills development. They make it possible for every young person to access high-quality international and cross-cultural education (both formal and non-formal) without physical mobility." (European Commission, 2022).

The concept of virtual exchange can in most instances be used interchangeably with the concept of **virtual mobility**. Since the beginning of the millennium, and even earlier, the concept of virtual mobility has been widely in use referring to situations when educational institutions seek to offer a complement or alternative to traditional 'real', physical student mobility (Vriens et al., 2021).

The concepts of asynchronous and synchronous distance teaching are at the core of understanding the positions presented in this article. In the Online Teaching Guide (2022) published by the VERSATILE project team, online teaching is defined as "distance teaching conducted in a virtual learning environment with electronic study content designed for self-paced (asynchronous) learning". An online learning management system (LMS), such as Moodle or Blackboard, is a necessity in asynchronous education, as it acts as a hub for asynchronous online teaching and learning. The educational content on an LMS should be structured in a logical way, since the students are expected to work independently, getting only limited support.

The concept of synchronous teaching does no stipulate where the teaching and learning can take place. The Open Learn platform defines synchronous teaching as follows:

"Synchronous teaching is where the teacher is present at the same time as the learner(s). This is almost always the case in a face-to-face environment. Synchronous teaching can also take place via online learning, through the use of video conferencing and live chat or instant messaging." (Open Learn, 2022)

In the collaboration between the four VERSATILE universities, the typical modes of synchronous teaching and learning consist of virtual and hybrid modes, which are discussed further in this article.

3. Joint curriculum of learning modules for four institutions

The goal of the VERSATILE project is to develop an attractive curriculum offering a virtual internationalization experience to students with diverse backgrounds in terms of study programs, academic experiences, IT-skills, technical resources and cultural backgrounds. In order to cope with this high degree of diversity and to utilize the differing backgrounds of students and teachers as a valuable resource in the classroom setting, the project partners have decided to develop an interdisciplinary curriculum under a common theme in the field of social sciences: European Scenarios in Business, Politics and Societal Change for the Next Decennium.

In the Hague Network Virtual Exchange, each university offers a single online bachelor-level course, each in different general subjects such as Marketing, Hospitality, Project Management and Intercultural

Communication, that students may take and transfer ECTS to their home university. Opening up existing courses posed administrative problems that could not be solved on a short- term basis. The courses that are offered in The Hague Network Virtual Exchange semester are designed and exclusively offered for students of the partners. However, they do not form an academically consistent set of courses and are very general in nature. This, in turn, has led to problems concerning ECTS transfer so that there is not yet a full online alternative to a physical semester abroad.

In the VERSATILE project, the curriculum includes eight courses of five ECTS each: four modules are related to political sciences and four to business studies. Each of the four partner organizations contributes two 5 ECTS modules to the joint curriculum based on their preferences, their academic profile, cooperating degree programs and available resources. Each module of the curriculum is developed by two educators from two partner institutions. Based on the above-mentioned allocation, each partner organization is responsible for the development of two modules. In order to ensure a broader view and enable cross-fertilization, one further educator from a different partner institution is assigned to each module. The educators work in a collaborative manner using virtual communications building on their academic and teaching expertise.

One of the main objectives of VERSATILE is to enable the partners to work together and jointly design, prepare and deliver courses that revolve around the same subject. Such courses can be delivered in a combination of some weekly classes and block workshops in order for example to ease timing issues. The focus is again on bachelor-degree programs with enough of an interdisciplinary approach to incorporate different theoretical and empirical viewpoints but also with a strong central theme to attract many different students. This approach motivates educators to participate in the development of new courses in which they are interested, to learn from international colleagues and, together with their students, to apply and extend their knowledge on current European affairs.

The subject 'European Scenarios in Business, Politics and Societal Change for the Next Decennium' was selected as one of several options, as it was the one where most Hague Network partners are able to join based on the programs they offer in English at bachelor level. Even though modules are newly designed for the online semester, they need to be complementary to existing curricula, in order to be able to draw on existing expertise and be sustainable. Partners chose current European affairs as so many developments are of interest and offer interdisciplinary approaches. Issues such as economic development, taxation, immigration, the need for skilled workers, cybersecurity, sustainability all form very relevant developments within the framework of European integration and form the foundation of an online semester that has relevance for young people and will motivate students. In addition, the last few years have seen a rising scepticism against the ideas of the European integration and the values of the European Union. This broad framework allows for an interdisciplinary discussion of these tendencies.

The innovative approach of using a central theme to create a collaborative curriculum for an interdisciplinary online semester serves as a direct response to the lost mobility option due to Covid-19 and also opens up vast opportunities for several target groups. Educators from partner institutions are motivated to work together, broaden their methodological and topical approaches, as well as their skills with regards to curriculum development. Students of the partner organizations receive additional course options and are able to benefit from the courses. The international and interdisciplinary approach allows students to further develop 21st century skills. Administrators and degree program managers receive an additional attractive element to complement their existing programs and collaborate with the participating institutions on the level of curriculum development. The broad topical approach and the online format that exposes students to an

international environment can be leveraged as part of an internationalization-at-home strategy. It can thus motivate students to more readily select mobility options in future. This format can be easily supplemented or expanded to also include physical mobility options in the future.

Prior to developing the curriculum, several administrative issues needed to be agreed upon to ensure attractiveness of the program for prospective students. These include specifically the agreement on a common IT-platform to provide course materials, a common format for course descriptions, common assessment forms and an agreed time frame for delivery. The last point was especially challenging as every institution follows their own academic calendar and teaching times are not streamlined. Within the project a period of roughly three months lasting from March until May was identified for course delivery. As courses may be delivered using a blend of synchronous and asynchronous elements, a timetable for the courses is going to be designed ensuring no overlap of courses, meeting the timing restrictions of instructors and reflecting the fact that this program is offered by institutions within Europe from three different time zones.

4. Common administrative infrastructure

As already stated earlier, the goal of the VERSATILE project is for students to be able to study at several institutions across several borders at the same time and by doing so letting students profit from Virtual Exchange to the fullest extent possible. A key aspect of the project is that students from four different institutions in four different countries study together during a single semester. This is different from a ring structure between more than two institutions, such as the ERASMUS Blended International Program (BIP) or some European University Alliance projects, in which every semester a different institution acts as the single receiving institution in which the students are enrolled. The fact that these types of single-semester multilateral virtual exchange opportunities are relatively rare, even after a surge of new projects funded during the Covid pandemic exploring different aspects of international virtual exchange, may already indicate the downside of such a scenario. Multilateral exchange means additional legal restrictions cross cutting through several national borders with different administrations, a far more complex constellation of colleagues working at different, non-comparable organizational units, in faculties as well as administration, and generally a greater likelihood for intercultural miscommunication in organization, teaching and learning. Different from bilateral virtual exchange or a ring structure, the multilateral single-semester approach places participating institutions against serious administrative challenges since students will need to enroll at each individual institution at which they will take part in the modules. By doing so, it is assured from the outset that all administrative and legal requirements at each institution are being covered and students can be guaranteed to be able to receive study credits from each institution that can be transferred to their home institution, thus making sure that the online semester has the additional advantage of a multilateral exchange for them.

In order to offset the administrative burden for the students, the project created an administrative infrastructure by setting up separate exchange agreements between partner institutions, creating an inventarisation of administrative procedures of each partner institution and setting up a joint administrative procedure for the nomination, registration and enrolment of students by means of a central registration portal. This will enable students to use the portal as a one-stop-shop registration to all modules at all partners. The portal will be hosted by one coordinating institution that will collect and distribute the information received through the platform so that the actual enrolment of the students can subsequently be done in the back office by the administration of the respective institutions.

It will be clear that this approach is not really a common administrative structure but rather an effort by partners to lift the additional administrative burden from the students to the institutions' administration and

enhance the attractiveness of the online semester. The willingness of universities to invest in the additional capacities needed for coordinating separate student administrations is however crucial to the success of the project and, unfortunately, without a feasible alternative for the time being. Such an alternative would need to come from the possibility to share students' information and by doing so to set up a transnational structure. Within the EU there is a clear willingness to do so, which can be seen for example by EU funded initiatives such as the development of a European student ID or the current Key Action 3 call for applications that would look for the possibilities to use existing European legal possibilities to do exactly this. It is however realistic to expect that it will take some time before universities will have a shared administrative framework that is practicable enough to replace the national systems.

5. Online teaching guide

5.1.   The rationale for an Online Teaching Guide

An Online Teaching Guide (2022) was created in the VERSATILE partnership to assist educators, both beginners and experienced, in designing cross-institutional international online teaching effectively and flexibly. Furthermore, the VERSATILE Online Teaching Guide was designed to support not only the VERSATILE partnership institutions, but any European higher educational institutions in implementing virtual exchange. Additionally, the Online Teaching Guide may prove useful in planning and executing domestic cross-institutional teaching and learning.

An essential part of the Online Teaching Guide is an Adaptive Toolbox, which contains the descriptions of the educational tools that are recognized to be relevant for the participating universities when implementing their courses for the common cross-institutional course catalogue. The Adaptive Toolbox will be discussed further below in this article.

The Online Teaching Guide takes a practical approach and a pedagogical view to virtual exchange and cross-institutional teaching and learning. The universities of the collaboration partnership do not provide identical educational resources, facilities or tools for their students and staff. To create a coherent experience for the students doing their cross-institutional studies, the Online Teaching Guide has been a necessity.

5.2.   Four teaching modes: virtual, hybrid, online, and collaborative

In the post-Covid situation the question remains, what exactly do the different teaching modes constitute? Based on a state-of-the-art analysis conducted in the partner universities of the VERSATILE partnership, the project actors decided to focus mainly on four distant teaching situations, which we call teaching modes, namely **Virtual, Hybrid, Online and Collaborative** teaching. We should be aware that there are various definitions for these teaching modes, and they can be partially overlapping, and they may even be used interchangeably. To avoid this kind of confusion in terminology, the VERSATILE Online Teaching Guide is using the following definitions.

Virtual teaching

Within the VERSATILE partnership, virtual teaching is defined as distance teaching conducted in a virtual learning environment with digital study content designed for live web-conferencing, **synchronous** online teaching and tutoring. As Barbour et al (2020) suggest, virtual teaching is also referred to as remote teaching (or emergency remote teaching) which typically uses a video conferencing platform and allows for a teacher to deliver lesson plans much as they would in a traditional classroom setting. Students can ask questions, garner needed clarity, and interact with academic content instantaneously with the support of a teacher.

When engaging in a live online session, there are a few guidelines to consider. The recommendations for educators and students for attending a live web conference session in a virtual learning context are divided in the Online Teaching Guide as follows:

- Recommendations for educators
    - before engaging in a session
    - during engaging in a session
    - after engaging in a session
- Recommendations for students
    - before engaging in a session
    - during engaging in a session

These recommendations can be found in more detail in the Online Teaching Guide (2022), and they are practical and easy to even print out on paper.

Hybrid teaching

With the concept of hybrid teaching, we mainly rely on the definition by the Tampere Universities' Teaching and Learning Centre:

> *"The term hybrid teaching refers to a classroom session that is attended remotely by some participants and in-person by others. Teaching takes place simultaneously but is not location dependent."* (TLC, 2022a)

In hybrid teaching and learning, regardless of how students and lecturers attend the session, remotely or on campus in a classroom, there should be a live experience of one, unified group. Hybrid teaching is another mode of **synchronous** teaching. Hybrid teaching provides a highly flexible alternative to participation for both students and the staff, but it requires a great deal of effort and updated pedagogical skills from the educators.

Online teaching

Many scholars have defined online learning in various ways, but in the context of the virtual exchange opportunities organized in the VERSATILE project, we follow Johnston's definition of online learning as an

> *"institutional or instructor-directed learning experience using technology that connects students to pre-developed content, where students have less autonomy but more flexibility to learn asynchronously, and they contact the teacher as needed."* (Johnston, 2020, p.3)

Essential prerequisites for successful online teaching and learning include well-functioning and pedagogically designed web-based tools and learning platforms. They allow lecturers to upload resources and create assignments online for the students to navigate and complete independently. This mode involves a self-driven, **asynchronous** approach to exploring content, in which the student is responsible for traversing the coursework individually.

Collaborative teaching

Collaborative teaching as such has a long history. It has been used to refer to any teaching practice that involves working in teams to deliver learning. More recently, with the increasing use of technology, collaborative teaching has expanded to the co-delivery of teaching across international borders. In the context of VERSATILE virtual exchange practices, the concept of collaborative teaching – or co-teaching – is defined as "teaching virtually, online, or hybrid together with two or more universities."

According to this definition, collaborative teaching can be either online, virtual or hybrid if co-delivered by several institutional actors across international borders. It should not be mixed with "collaborative learning", which refers to a learning process where all group members have a common assignment and goal and where they attempt to build shared meaning, commitment, and understanding while interacting with others. The idea of VERSATILE collaborative teaching or co-teaching is illustrated in figure 1.
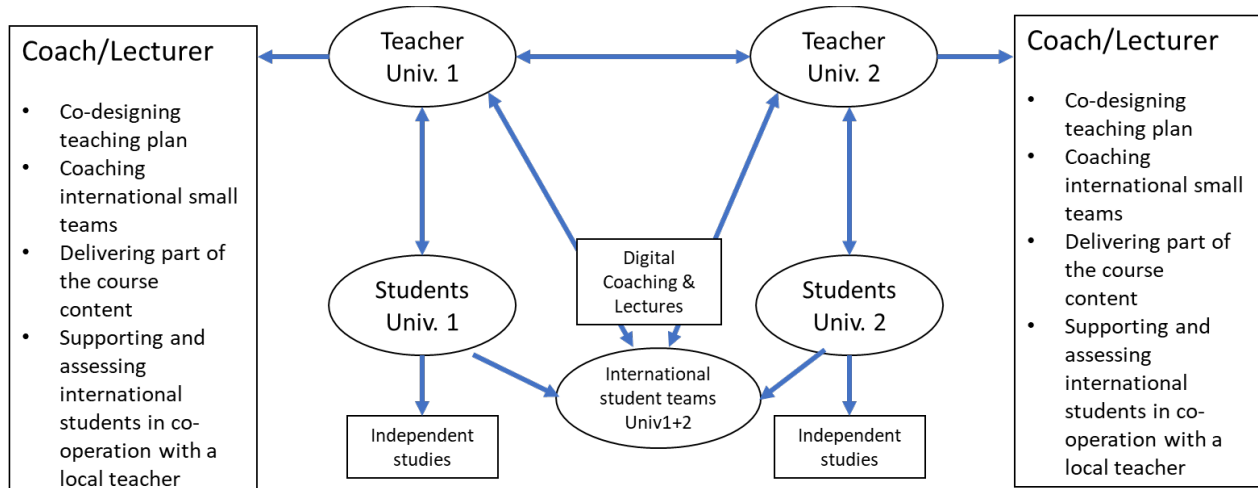
Figure 1: VERSATILE Co-teaching Model (Online Teaching Guide, 2022).

The VERSATILE Co-teaching model is based on a model for digital collaborative teaching introduced by Hao, Zhu, and MacLeod in their conference paper in 2016. They define co-teaching as "a course, which is formally co-designed, with equal teacher participation, and co-delivered by two or more teachers that may be geographically in different locations within one or more combinations of different educational entities" (Yang, Zhu & McLeod, 2016).

5.3. Pedagogical models

The VERSATILE project team understands the concept of a pedagogical model primarily as a way of organizing teaching and learning activities so that it helps students to learn in a pedagogically sound and structured manner. There are a plenty of different pedagogical models, which are influenced by the current understanding of the nature of learning. Pedagogical models facilitate the planning of teaching, as well as creating and directing the learning and teaching process.

The pedagogical models discussed in the Online Teaching Guide include:

- Case-based learning
- Challenge-based learning (CBL)
- Dialogical learning, or dialogue in learning
- Flipped learning
- Project-based learning
- Problem-based learning
- Cooperative learning
- Collaborative learning
- Game-based learning
- Simulation pedagogics

All the models listed above are considered applicable in their appropriate contexts of cross-institutional learning. In the section of the pedagogical models, the Online Teaching Guide gives credit to the Teaching and Learning Centre (TLC) of the Tampere University and Tampere University of Applied Sciences for its numerous citations and references. (TLC, 2022.)

5.4. Process of distance teaching

When planning a course in a distant teaching format, basically the same planning steps are required as for a course taking place onsite:

1. Determination of teaching plan
2. Determination of learning outcomes
3. Analysis of learning environment
4. Consideration of administrative requirements
5. Selection of tools and methods
6. Assessment
7. Preparation of course documents

However, when choosing a distant teaching mode, we need to focus more on the learning environment and the teaching methods and tools and ensure a consistent alignment of these. If the course is delivered in a collaborative setting, these steps and aspects deserve even more careful consideration. The seven steps discussed in the Online Teaching Guide are presented in figure 2. These steps are partially interrelated, and they may require a feedback loop.

Pedagogical

- Determine learning outcome
- Determine assessment
- Determine your teaching plan
- Prepare course description

Administrative

- Analyse learning environment
- Consider adminsitrative requirements
- Determine tools and methods
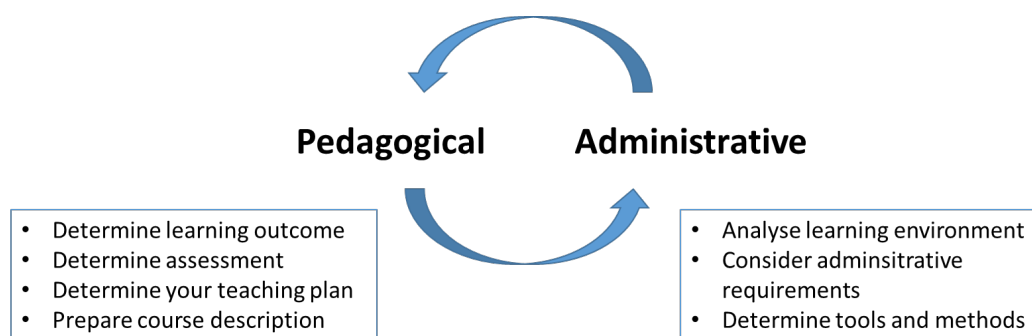
Figure 2: Seven steps of planning distance teaching (Online Teaching Guide, 2022).

In the Online Teaching Guide each of the steps is briefly introduced. Descriptions of the steps are provided in a way that they are not focusing on practices of any specific university. Defining the steps quite generally, but on the other hand, including the necessary details relevant for the collaboration partnership of the universities makes the process of distance teaching presented in the Online Teaching Guide useful for a wider audience.

5.5. Good practices

In the Versatile collaboration, experiences and good practices of cross-institutional international teaching have been shared in the project meetings online and in a face-to-face session in Finland. At the time of publishing this article, two videos of shared good practices are openly available.

In the first video Tuula Andersson, Senior lecturer in Business and Media at Tampere University of Applied Sciences (TAMK), Finland, shares her valuable 10-year experience of running a course on International Brand Management with partner universities in the Netherlands, Belgium and the Czech Republic. The student groups were mixed having students from all four universities. In another video Fabian Dargel, M.Sc., Scientific

assistant from Hochschule Rhein-Waal, Germany, shows a concrete example of how to structure an online course on Moodle platform. These videos can be found as a part of the Online Teaching Guide, at https://versatile-erasmus-project.eu/online-teaching-guide/good-practices/.

6.   Adaptive Toolbox for cross-institutional education

6.1.   Purpose of the Toolbox

Designing and organizing studies for virtual exchange can be challenging for both the lecturers, professors, teachers and students. Within the Versatile collaboration partnership, student groups are mixed, consisting of students from four institutions: Hochschule Rhein-Waal (HSRW, Germany), Tampere University of Applied Sciences (TAMK, Finland), Masaryk University (MUNI, Czech Republic) and the University of Derby (UoD, UK). The academic staff is also mixed, as two educators, each from different universities, are co-teaching during each course implementation.

An Adaptive Toolbox was created to help these key actors, as well as educational designers to select pedagogically functioning digital tools for their cross-institutional courses. The Toolbox is a practical tool designed to facilitate mainly all the teachers' work in an everyday context. The Adaptive Toolbox (2022) can be found on the Versatile project website.

6.2.   Criteria, filtering and layout

The versatile project members have agreed on the criteria, the taxonomy to sort out the educational tools in this context. The concept of a 'tool' is understood quite broadly. Tools can include digital applications that are freely available, open-source or hosted by a university. In our understanding also resources such as learning design models, simulations, videos etc. can be classified among tools.

In the Versatile project partnership, the following classifications of tools were agreed on, and they were applied as search criteria in the Toolbox application:

1. **Learning type:** Acquisition / Collaboration / Discussion / Investigation / Practice / Production. These six criteria are provided by the widely used ABC Learning Design (2022) model created by Clive Young and Nataša Perović.
2. **Purpose of the tool:** This is a category, which includes values like Teamwork/Co-creation, Meetings, Audiovisual creation, Games, Presentation, Production etc.
3. **Licence type:** Free / Freemium / Commercial

In the Toolbox, the user will initially have a grid view of all the tools included in the Toolbox. The user will be able to restrict the set of tools by selecting values of the Toolbox categories (Figure 3).
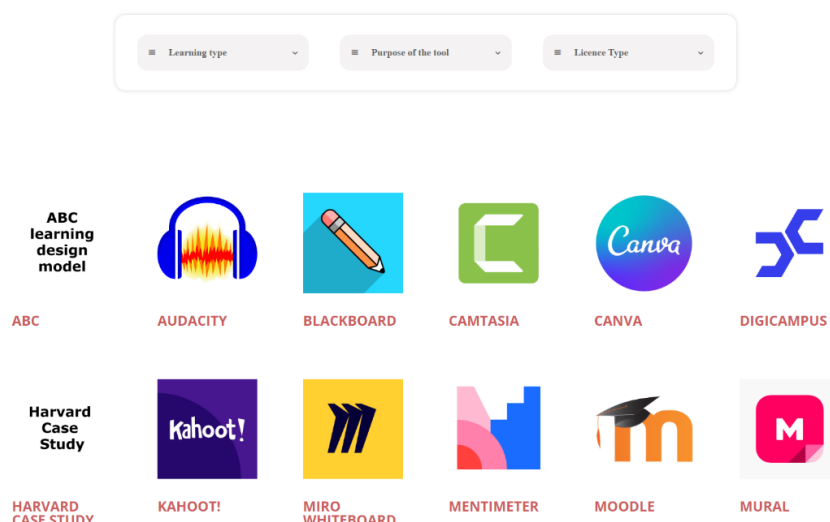
Figure 3: The user's selections in the drop-down lists: Learning type / Purpose of the tool / Licence type, will define which tools appear in the grid view (Adaptive Toolbox, 2022).

When clicking on a tool in the grid, the user will land on a tool card page, where a description of the tool is provided. The tool card shows the following information about the tool in question:

- Tool name
- Learning type (according to ABC learning design)
- Purpose of the tool
- Short description of the tool
- License type
- Teacher quotes
- External links
- (An option for) embedded video, image or slideshow

The Adaptive Toolbox will be openly available at https://versatile-erasmus-project.eu/toolbox/.

7. Conclusions

At this stage we do not have the student experience yet, as the courses are about to start in the Spring term of 2023. However, with the development of the online teaching guide and the toolbox as well as the guideline for administrative infrastructure, the major challenges to offering a collaborative online semester abroad have been identified and potential solutions have been developed. The two guides provide extensive guidance for academics and administrators alike who seek to develop virtual exchange opportunities. The extensive writing phase allowed a lot of knowledge-sharing and cross-fertilization between the project partners, involving not only academic but also administrative staff. Often academics seek to internationalize their programs but are quickly confronted with administrative obstacles. These obstacles usually increase the more partners are involved. Our guides assist higher education institutions in designing virtual mobility elements beyond fairly standard COIL projects. This enables institutions to utilize the benefits of online teaching for their internationalization activities. Currently a short pilot course will be provided collaboratively by Tampere University of Applied Sciences (Finland) and University of Derby (UK) with 20 students, 5 students from each collaborating HEI. During this course, first student experiences will be collected, and further critical issues may be resolved.

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ACA
ACADEMIC
COOPERATION
ASSOCIATION

Students' motivations for Blended and Virtual International Exchanges During COVID-19

Snapshot Survey Report

ACA Thematic Peer Group 5: New Mobility Formats

Students' motivations for Blended and Virtual International Exchanges During Covid-19 - Snapshot Survey Report

ACA Thematic Peer Group 5: New Mobility Formats

Disclaimer:

The author and editorial team drafted this report in 2022, following reconsideration of the term 'virtual mobilities'. Even though the 2021 questionnaire conducted used the term 'virtual mobilities', this report uses 'virtual exchanges'. To read more about why the terminology has changed, please consult the following **article** by EAIE Vice-President and Senior Policy Advisor for Internationalisation at the University of Antwerp, Piet Van Hove.

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INTRODUCTION

1. Introduction

The Academic Cooperation Association (ACA) is a European association of national organisations that promote and fund the internationalisation of higher education. ACA members are involved in a wide range of activities, including: the delivery of student and staff mobility programmes (in most cases including the Erasmus+ Programme,) promoting and marketing their countries' higher education programmes worldwide, curriculum internationalisation, and policy advice. ACA has a dual mission. First, it serves as a platform for mutual learning and the exchange of good practice among its members, for joint projects and activities, and for advocating its members' interests to EU institutions and national governments. Second, it is a think tank that works on issues of internationalisation and innovation in higher education. In this capacity, ACA carries out research into the internationalisation of higher education, producing studies and evaluations.

ACA has created a number of Thematic Peer Groups (TPGs) as a significant way for its members to discuss specific topics in international higher education and to exchange experience and insight. New Mobility Formats was first established as a TPG in 2020, to explore the intersection between digitalisation and sustainability, discussing emerging trends and issues related to what were then seen as new mobility formats. International student and staff mobility is an essential pillar of higher education internationalisation, in which participation trends, formats, and modes are evolving continuously. Through this TPG, ACA's long-standing commitment to mobility format research is enhanced by members' country-specific expertise and networks. The group aims to synthesise and explore emerging trends in blended and virtual exchanges, and to build trust in their results.

International learning experiences with online elements are not new developments *per se*. Blended or hybrid formats (international mobility combined with an online learning component either before or after physical mobility), virtual exchanges, or more integrated formats like Collaborative Online International Learning (COIL) existed long before the COVID-19 pandemic. However, lockdowns accelerated the need for new, digitally enhanced international experiences, and multiplied the models and arrangements applied, expanding them beyond previous ideas and practices.

The 'digital experiment' of the last two years has created many challenges for institutions, staff, and students. But it has also given new impetus to developing models originally

designed to enrich and expand the mobility experience that were used as emergency measures to continue providing education during the pandemic. In mid-2021, the New Mobility Formats TPG decided to survey students' experiences of these formats during the pandemic. Some of the main issues identified by the snapshot survey results include: infrastructure transformation, support, the ongoing quality of teaching and learning, the digital divide, intercultural considerations, and computer literacy. The study therefore helps put both the current reality, and also the future potential of these new mobility formats, into perspective.

This report is based on the data from the above-mentioned survey. The first two chapters provide background information and an overview of methodological issues, including data collection, analysis, and sample characteristics. The third chapter explores the key findings in terms of respondents' satisfaction, motivations, and the strengths and weaknesses of these new (blended and/or virtual) mobility formats. The fourth and final chapters set out the conclusions and provide recommendations for the higher education sector, building on the survey results.

METHODOLOGY

2. Methodology

2.1   The study

The 2021 study by the Academic Cooperation Association (ACA), launched in the framework of its New Mobility Formats Thematic Peer Group (TPG), was designed to identify the strengths and weaknesses of new mobility formats. Research was carried out from a dual perspective, focusing on both blended (physical mobility combined with an online component) and virtual (online only) exchanges, to highlight student experiences during the pandemic. It is therefore an opportunity to reflect on the potential impact and future potential of these new mobility formats.

2.2   Data collection and analysis

The study relied on a snapshot survey conducted online in the period from 7 June to 12 July 2021. The target group comprised outgoing students enrolled in EHEA countries who had taken part in blended or virtual student exchanges in 2020 or 2021, regardless of their year of academic enrolment. The survey comprised a total of 10 questions, including two open-ended questions to gather statements about their experiences from the students. None of the questions were obligatory: respondents were able to freely skip questions. The resulting quantitative data was analysed using SPSS software and Excel, while the qualitative data submitted in answer to open questions was coded to identify and assess key trends, and the most representative statements were selected to provide contextual background. The results of this process produced the conclusions and recommendations shared in the final part of this report for the benefit of local, national, and international stakeholders.

Survey dissemination was supported by ACA members, who distributed the survey to higher education institutions, who in turn publicised it to their students who had undertaken exchanges during the pandemic. Researchers used random sampling to produce the results; respondents cannot be considered representative as the response rates from each country varied considerably, with a substantial overrepresentation of students at German HEIs. The results are therefore only representative of the survey's sample and should not be generalised. Nevertheless, they do allow us to reflect on digitally enhanced international experiences during the pandemic.

2.3   Data sample and respondent profile

In total, 1197 respondents from 35 countries across Europe took part in the survey. Most of the respondents ((301) or 25.15% of those who disclosed information about the country where they were registered before joining a virtual or blended exchange programme (n=1197)), were in Germany, while 7.18%, 6.43%, and 6.18% were in France, Austria, and the Czech Republic respectively. Georgia, Greece, Iceland, Malta, and North Macedonia were also represented but by less than 1% of the respondents.
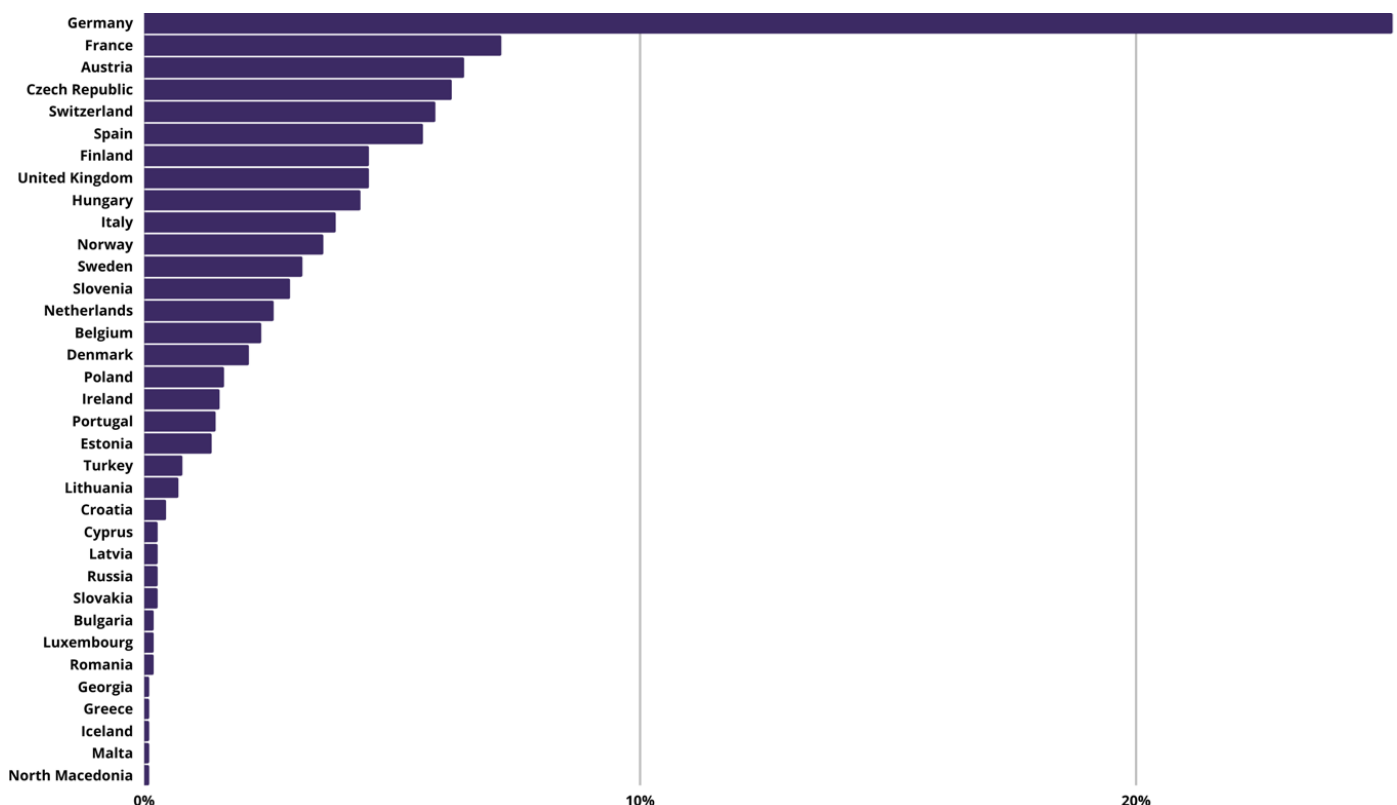
Figure 1: Which country were you registered in before joining a virtual or blended mobility programme?

In terms of the respondents' level of studies, the majority (n= 1,197) were studying for their bachelor's degree (56.98%), followed by master's degree level students (38.01%). Short and third cycle respondents were least represented at 3.26% and 1.75% respectively.
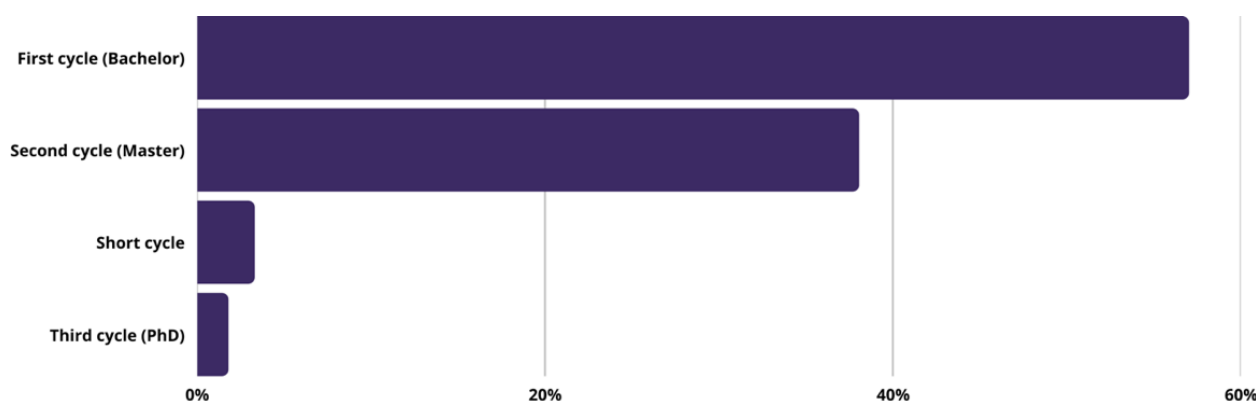
Figure 2: What level of studies were you undertaking during your mobility experience?

The survey asked respondents to select which of eight exchange programmes supported their exchange. Some 991 out of the 1,195 students who answered this question (82.93%) were involved in Erasmus +. The Swiss-European Mobility Programme (SEMP) achieved second place with 9.37% of respondents. Other mobility programs, such as the Barrande fellowship, the north2north mobility programme, and the DAAD PROMOS programme, represented less than 5% of the responses.
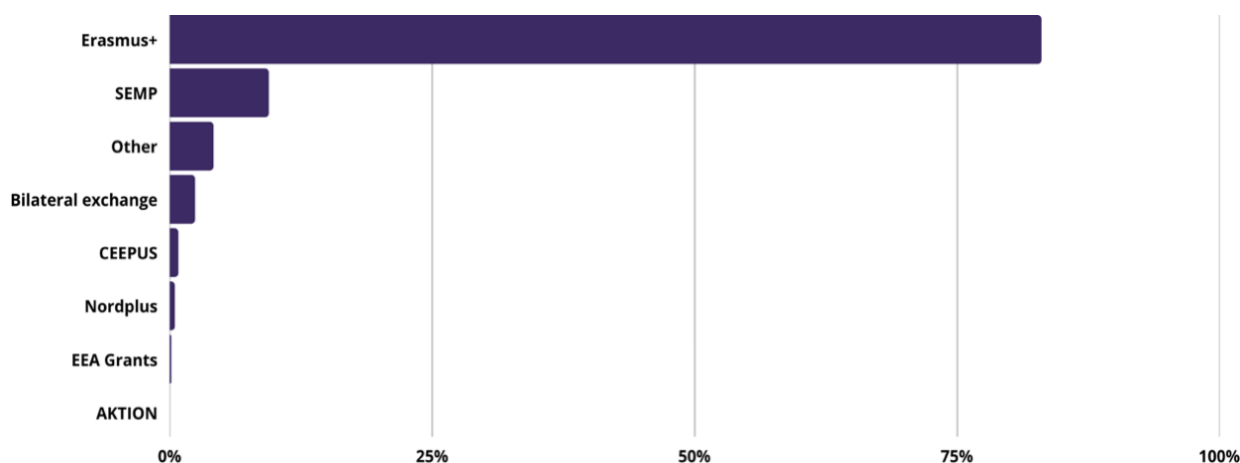
Figure 3: Which exchange programme supported your student mobility experience?

KEY FINDINGS

3. Key findings

3.1.   Satisfaction

Respondents were asked about their satisfaction with blended or virtual experiences. Just over half (54.51%) of the students who answered this question (n=1,197) were **Satisfied** with their mobility experience. Just over half of that number were **Very satisfied** with their experience (30.63%). While the smallest group of respondents were **Dissatisfied** (11.85%) and **Very dissatisfied** (3.01%).
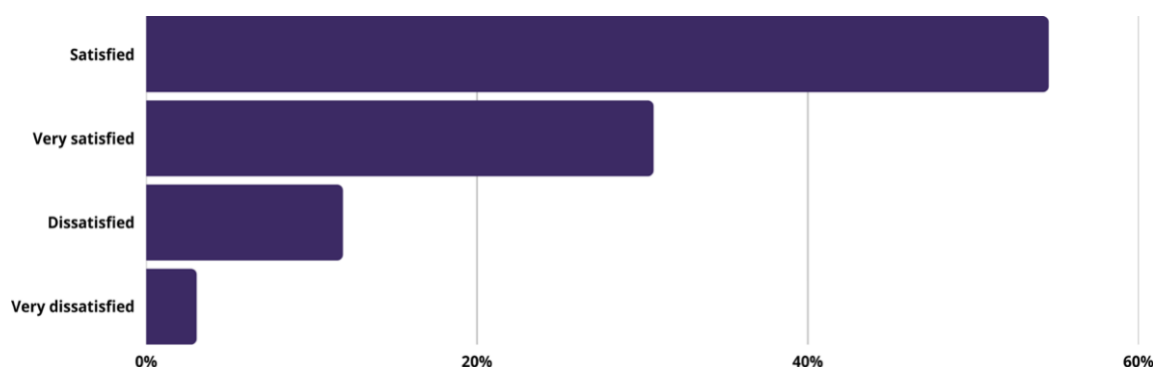
Figure 4: How satisfied were you with your blended or virtual mobility experience?

A comparison of the satisfaction results against respondents' level of studies revealed no significant differences. Similar percentages of students reported similar levels of satisfaction across all cycles.
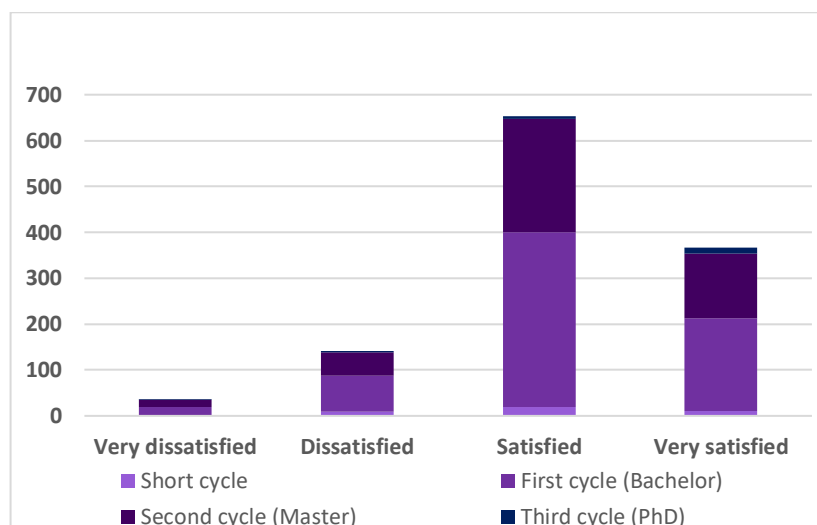
3.2.   Reasons for choosing blended and/or virtual exchanges

The survey results revealed eight different reasons for choosing blended or virtual exchange studies. Most students (n=1,170) reported selecting blended or virtual exchanges because of health-related precautions/safety, including pandemic-related restrictions (52.65%). Their second motive was the "Chance to have any international experience when physical mobility is not possible" (31.45%), followed by other reasons such as online language courses (24.27%). A minority chose these formats because of lower costs, an inability to travel (during the pandemic), family or job circumstances and stress-related reasons; representing less than 5% of the overall response rate. Some 24.27% of the respondents selected "Other" as their answer to this question, and reported factors including "to reduce the stress caused by uncertainties due to chaotic organisation and communications with universities and constantly changing restrictions," which suggests that some HEI responses to the situation were inadequate; and 'completing studies faster'.
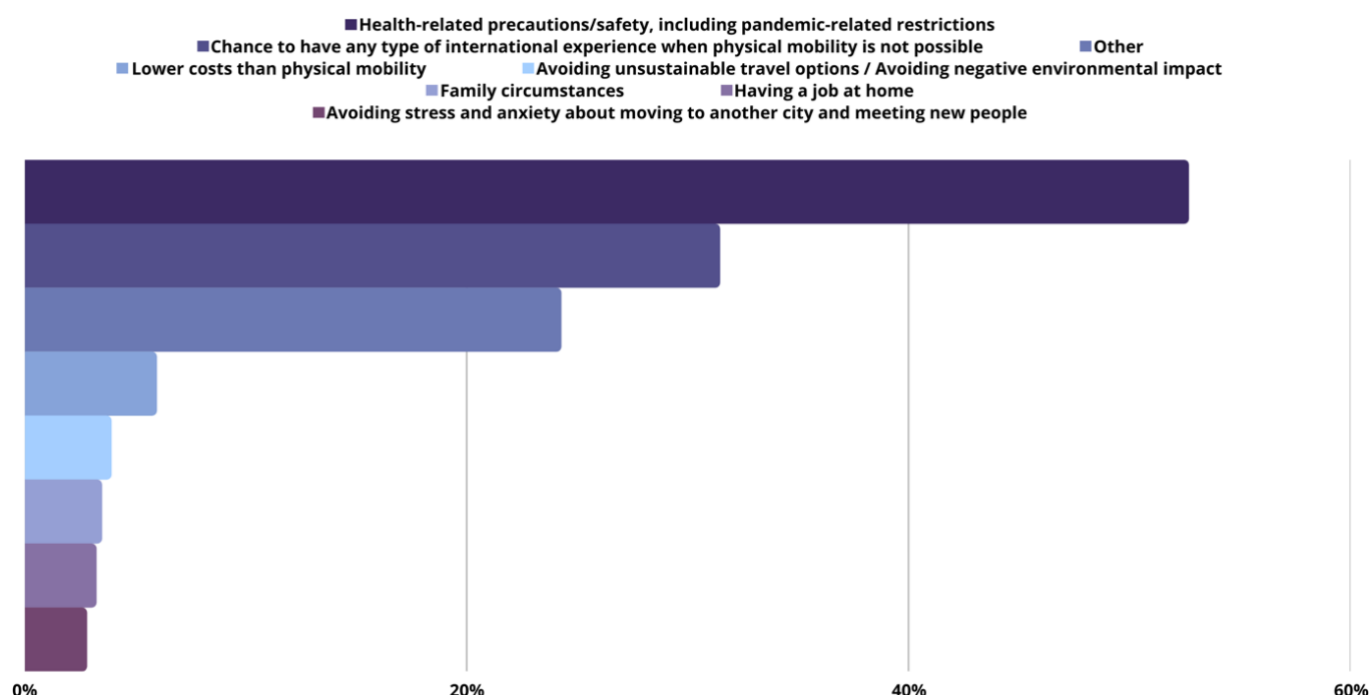
Figure 5: What was your main reason for undertaking a blended or virtual mobility experience?

3.3.   Strengths and weaknesses

The survey results identified a range of strengths in digitally enhanced, blended and virtual exchanges. Given that the survey was conducted in June 2021, when there was a temporary lull in COVID-19, "Health-related or safety precautions" (46.72%) and the "Chance to have any type of international experience when physical mobility is not possible" (46.64%) emerged as the key reasons for choosing virtual or blended exchanges (n= 1,160). Since respondents were allowed to select more than one answer to this question, we can assume significant overlap between these two answers, especially given the near-identical response rate. But other enabling factors were also highlighted, such as reduced costs and increased compatibility with personal circumstances such as a permanent job or family ties (5.98%, 3.50%, and 3.25% respectively). Here, 16.90% of the respondents answered "Other" and highlighted the flexibility of such exchange formats, which make time management easier; as well as their cost-effectiveness and the ability to "virtually meet other students who wouldn't be able to undertake an in-person exchange". In future, health-related precautions should lose prominence as a motivating factor. It is safe to assume that most of the blended or virtual mobility students undertaking these programmes as an emergency measure will prefer physical mobility programmes when safety precautions become unnecessary. However, part-time students or students with children may retain their interest in these formats.
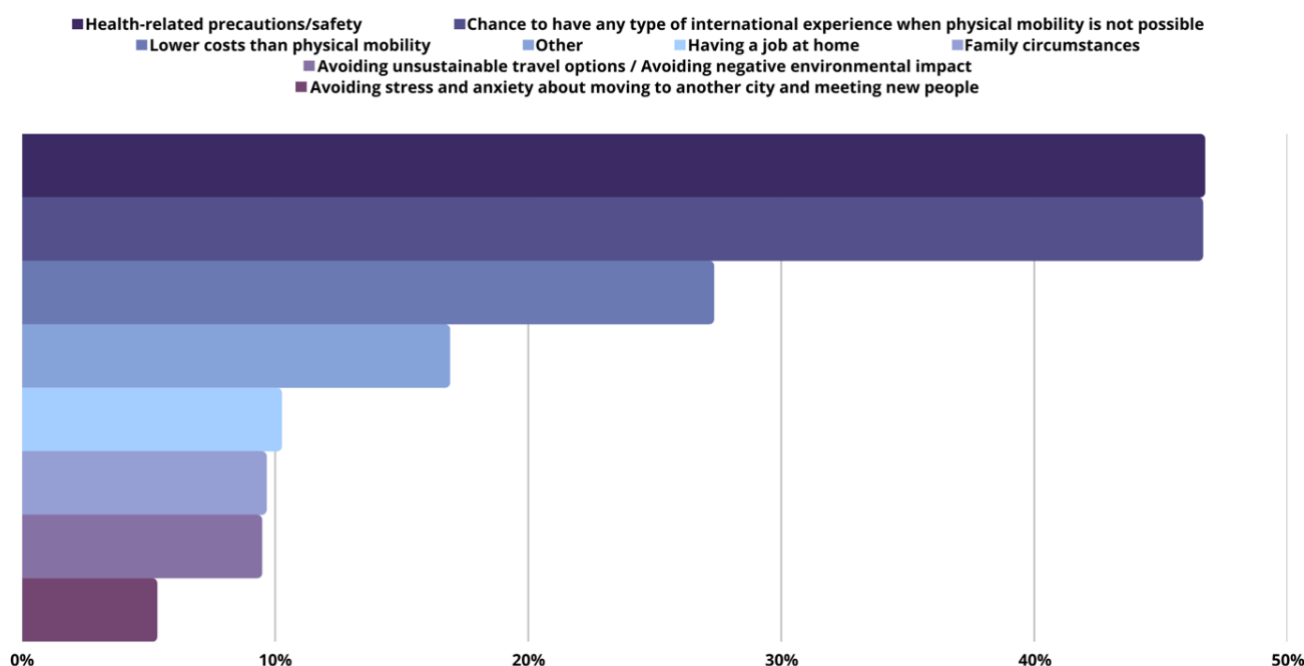
Figure 6: What were the two most important strengths of blended or virtual mobilities in your experience?

In terms of the weaknesses of blended and/or virtual exchanges, 87.91% of the respondents mentioned the lack of in-person connections, which is particularly relevant in purely online exchanges, followed by 42.01% who criticised the (inadequate) quality of teaching and learning. "Access to campus services" (25.27%) and mental health concerns (23.92%) were cited as two other weaknesses, while "Support from the administrative staff" (11.24%) and "Lack of a quiet space for learning at home" (10.74%) were significant drawbacks, but for a smaller number of students. While "Lack of proper technology for learning" and "Worries about the recognition of credits and degrees" were cited by less than 10% of the respondents. "Other" scored 6.85%, with respondents mentioning online classes lasting too long, that learning was less interactive, and that they found it hard to concentrate due to the lack of nonverbal communication (body language, etc).

■Lack of in-person experience (Meeting other students in person, getting to know the city, etc.) ■Quality of teaching and learning
■Access to services on campus ■Worries about mental health ■Support from administrative staff
■Lack of quiet space for learning at home ■Lack of technology (devices, internet connection, etc.)
■Uncertainty about recognition of credits and degrees ■Other

Figure 7: What do you think are the two most negative aspects of blended or virtual mobility?

3.4.   Challenges and recommendations

The snapshot survey allowed respondents to describe the challenges faced during these mobility formats, and to provide feedback in the form of suggestions for improvements. Students at various institutions noted that several components of blended or virtual mobility formats needed improvement. In their view, universities need to find the right balance between on-site and online classes, to ensure enough interaction with other students.

Lack of student engagement was frequently mentioned. Respondents recommended changing the way in which lectures are organised to reduce academics' participation and increase the number of interactive exercises and opportunities for student group work. Students also faced problems caused by unstable internet connections and needed support to use university platforms and solve IT issues. Some were very dissatisfied with the poor instructions provided in class and recommended that academics should be given more training in how to conduct online lectures to improve quality. Another comment noted the need to enable more social contact, including between local students and visitors, and for online events and language courses. A small group of respondents also recommended students turn their cameras on to create a sense of community and inclusivity during online classes.

> *"Mobility programmes are primarily for personal growth. The past semester focused on continuing studies through online lectures, and generally ignored cultural aspects. Although maintaining studies is essential, cultural aspects also need to be facilitated."*

> *"Blended or virtual exchanges may already be quite sophisticated on an academic level. However, the lack of in-person experience needs to be compensated for, and this did not happen in my case. Improvements should aim to create in-person experiences."*

Most of the students surveyed were critical of blended or virtual exchanges. They mentioned having received little support from the international office regarding up-to-date information on border restrictions, changes, costs, regulations, and the opportunities available. Some were unhappy at losing their scholarships when studies moved online, while others lacked the motivation to take part in online courses and had to overcome stress and confusion.

> *"Whereas blended learning is better for students' mental health, virtual mobilities can help students take part in the Erasmus programme without having to move to a different country with stricter restrictions in force. However, Erasmus broadens your horizons through several multicultural encounters. So, improvements may be: fewer assignments, more interactive sessions, more intercultural communication and the chance to get to know the country without struggling with increased social isolation."*

> *"Virtual mobility is no substitue for physical mobility. The full experience of such a good programme is based on face-to-face interaction and should continue. I could imagine virtual mobility as an additional programme for people who do not physically want to go abroad, perhaps for financial reasons, or more generally for people who want international interactions during their studies without going abroad for an entire semester. I think the idea of integrating virtual mobility in study programmes has a lot of potential."*

Respondents also noted the need for mental health support on such programmes. Many believe blended and virtual exchanges should only be an option when it comes to travel difficulties, illness and disabilities, learning languages with speakers living in other parts of the world, and for other time-saving purposes.

"There could be new interest in blended or virtual mobility when people cannot easily move to another country, but still want to study internationally. But in my experience, a big incentive to studying abroad is getting to know another culture or country and engaging with the local and other international people. It was often impossible to meet other people due to the COVID-19 restrictions during my time abroad. It is obviously nobody's fault, but we wanted more engagement with our fellow students. It is very hard to socialise and connect with other people in virtual lectures and seminars!"

"Universities need to seriously consider virtual education as an integrated part of the future of teaching - and not just as a temporary solution for the pandemic. We need to improve the technology available to academics and students, and make lessons interactive, even when they're online, with the help of different tools. There's much to be done to catch up on decades of neglecting the opportunity to move education online. The pandemic caught us unprepared. On the other hand, a big part of mobility is meeting other people and exploring the host country. I doubt anything of this nature can be properly organised in these online formats."

Erasmus + cultural exchange was another concern mentioned by most students, since this is primarily possible when students are actually in another country. Blended mobilities are better than purely virtual exchanges for such purposes. Some respondents also believed online classes were not taken as seriously, and noted that their exams and assignments were evaluated in a rather obscure way.

"A good suggestion would be a hybrid system in which online and offline teaching is available for the same course at the same time. This way, those who are able to visit the country in person can attend course in person and other students who either can't or don't want to spend a semester abroad can access the same course, at the same time, with the same teachers, online."

"Structured lectures and opportunities to meet other students online. Access to traditional campus support services, such as printers and libraries. For instance, there could be a system allowing students to send files to the university for printing and collection via a pick-up service. When you are in a rural area in another country, practical issues can be real struggles."

However, some students were satisfied with the support received. In view of this, students recommended that universities reconsider the administrative aspects of blended or virtual exchanges, to consider additional costs such as online book purchasing, to provide clear instructions and schedules with a fixed number of classes and hours dedicated to online teaching and learning.

3.5. Interest in future blended and/or virtual exchanges

In this final question, students were asked about people's overall interest in blended and/or virtual exchanges and how this will evolve. Most (36.86%, n=1,191) believe this will tail off, while 23.09% thought that interest will increase and 22.59% that it will remain the same. Some 17.46% of respondents were too uncertain to predict future trends.
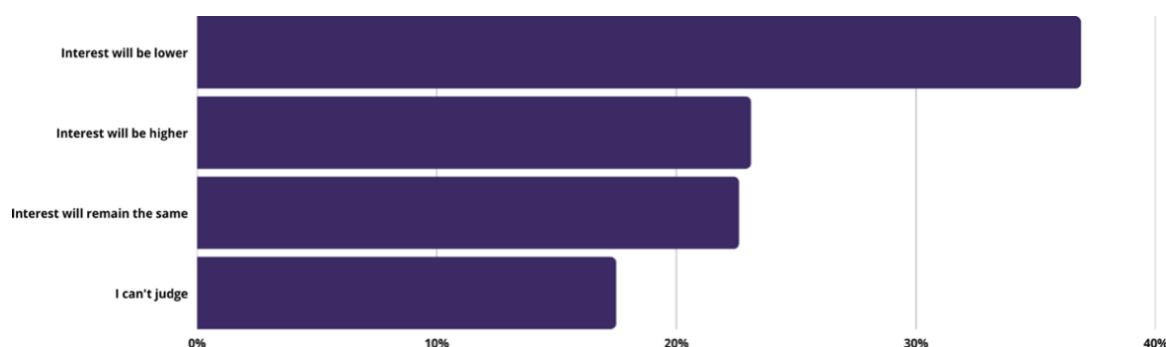
Figure 8: How do you think people's general interest in blended and/or virtual mobilities will evolve, based on your experience and that of your fellow students?

CONCLUSIONS

4. Conclusions

Across the EHEA, many higher education institutions increased their provision of virtual and hybrid exchanges due to the COVID-19 pandemic. This report sheds light on some of the resulting key trends and issues to emerge from the 2020 and 2021 pandemic waves. It also provided insights into the future of these new mobility formats.

Student experiences of blended and virtual exchanges varied. They reported many technical and content challenges, and alluded to a lack of capacity to deliver such new mobility formats. Although the survey targeted students who took part in virtual and blended exchanges during the pandemic, which meant that their experiences were of *ad hoc* programmes not embedded in institutional curricula, some students were satisfied with their experience. However, a unified teaching platform across each institution would have enhanced the respondents experiences, and avoided exposing them to the different approaches followed by different academics.

The multiplication of digitally enhanced teaching and learning over the past two years also presented many quality issues and questions. How can the quality of learning and teaching be ensured? How can we guarantee that online learning outcomes are comparable to those achieved while studying in another country? There is also the issue of quality admin support, including the need to remedy the bureaucratic difficulties inherent in blended and virtual exchanges, the question of financial support for virtual exchanges, and the ability to provide support services to virtual/blended mobility students. In addition, the lack of an in-person experience and limited intercultural nature of online exchange programmes seem to have had a significant impact on mental health, with several respondents reporting this issue as one of the reasons why their experience of blended or virtual mobility was not satisfying.

Following COVID-19, the digital transformation of European higher education has received strong political backing, through several high-level EU policy and programme initiatives, such as the European Education Area; the Digital Education Action Plan (2021- 2027); the Erasmus+ programme (2021-2027); the European Universities Initiative; the European Strategy for Universities; the European Student Card Initiative and the Erasmus Without Paper project, among others.

It is, therefore, high time to address the aforementioned challenges and recognise these new mobility formats' potential to provide opportunities to people who would not otherwise have been able to go on an exchange programme. Blended and virtual exchanges should therefore develop from being an *ad hoc*, temporary solution, to becoming an integrated part of HEI internationalisation.

4.1. Brief recommendations for the sector

Based on the results of the snapshot survey, the Academic Cooperation Association has compiled the following list of brief recommendations for the European Commission, national governments, policy makers and higher education institutions.

1. ***Bottom-up approaches must receive continued support and be further enhanced through top-down policies,*** *to ensure the delivery of high-impact blended and virtual exchanges and the uptake of digital technologies. The European Commission should continue to increase support for both blended mobilities and virtual exchanges, while national governments should recognise that technology is essential and requires investment, funding staff digital training and supporting HEI provision of technical materials and digital infrastructure.*

2. ***As quality considerations become paramount for all of the actors involved, there is a clear need to investigate and discuss what high-quality blended mobility approaches and virtual exchanges mean in practice with the higher education sector,*** *so as to work out how to ensure quality.*

3. ***Higher education institutions also need to invest in student support services for digitally enhanced exchanges.*** *It is very important to recognise these students' specific needs. There is a clear need to establish real connections between institutions and such students through structured approaches.*

4. ***University approaches to such digitally enhanced international higher education exchanges should prioritise meaningful and impactful social interaction.*** *Although blended mobilities include in-person interaction, higher education institutions still need to reconsider their planning and delivery to ensure maximum results. As virtual exchanges only provide online connections, higher education institutions should strive to make these programmes as interactive and engaging as possible.*

5. ***University associations and relevant European networks should facilitate the sharing of experiences and good practice among higher education institutions**, channelling the discussions, and information about the reality on the ground to EU level, providing much-needed feedback to policy makers in order to drive good progress.*

4.2.   Final remarks

While blended and virtual exchanges were a largely *ad hoc* solution to providing continuous learning during the COVID-19 pandemic, these mobility formats are expected to enable more people to take part in internationalisation practices in future. Due to the varied quality of these digitally enhanced models, many of which were created as "emergency" solutions during the COVID-19 pandemic; and in view of the lasting impact of online learning on student well-being and mental health, students currently seem to have limited interest in these types of exchange, and their motivation may decrease further, as the desire for in-person experiences rebounds. However, it is important to highlight that blended and virtual exchanges should not replace physical mobility, they should enhance internationalisation.

Blended and virtual formats are now recognised as important tools, and supported and mainstreamed via the new Erasmus+ programme (through Blended Intensive Programmes and Virtual Exchanges grants). Considering their potential benefits regarding inclusion and sustainability; and in view of the lessons learned from the pandemic, more in-depth analysis is needed to identify different perspectives in student motivations. This would allow us to clearly identify the added value of new mobility formats, by targeting students who chose these formats, rather than who were 'forced' into them by the pandemic, which was true in most cases during 2020 and 2021.

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SURVEY QUESTIONS

6. Survey Questions

Question 1: Which country were you registered in before joining a virtual or blended mobility programme?

Question 2: Which exchange programme supported your student mobility experience?

- o First cycle (Bachelor's)
- o Second cycle (Master's)
- o Short cycle
- o Third cycle (PhD)

Question 3: Which exchange programme supported your student mobility experience?

- o Erasmus+
- o Swiss-European Mobility Programme (SEMP)
- o Bilateral exchange
- o CEEPUS
- o Nordplus
- o EEA Grants
- o AKTION
- o Other (please specify)

Question 4: How satisfied were you with your blended or virtual mobility experience?

- o Satisfied
- o Very satisfied
- o Dissatisfied
- o Very dissatisfied

Question 5: What was your main reason for undertaking a blended or virtual mobility experience?

- o Health-related precautions/safety, including pandemic-related restrictions
- o Chance to have any type of international experience when physical mobility is not possible
- o Lower costs than physical mobility
- o Avoiding unsustainable travel options / Avoiding negative environmental impact
- o Family circumstances
- o Having a job at home
- o Avoiding stress and anxiety about moving to another city and meeting new people

o   Other (please specify)

Question 6: What were the two most important strengths of blended or virtual mobilities in your experience?

- o   Health-related precautions/safety
- o   Chance to have any type of international experience when physical mobility is not possible
- o   Lower costs than physical mobility
- o   Having a job at home
- o   Family circumstances
- o   Avoiding unsustainable travel options / Avoiding negative environmental impact
- o   Avoiding stress and anxiety about moving to another city and meeting new people
- o   Other (please specify)

Question 7: What are two most negative aspects of blended or virtual mobility in your opinion?

- o   Lack of in-person experience (Meeting other students in person, getting to know the city, etc.)
- o   Quality of teaching and learning
- o   Access to services on campus
- o   Worries about mental health
- o   Support from administrative staff
- o   Lack of quiet space for learning at home
- o   Lack of technology (devices, internet connection, etc.)
- o   Uncertainty about recognition of credits and degrees
- o   Other (please specify)

Question 8: What could be improved to enhance blended or virtual mobilities?

Question 9: How do you think people's general interest in blended and/or virtual mobilities will evolve, based on your experience and that of your fellow students??

- o   Interest will be lower
- o   Interest will be higher
- o   Interest will remain the same
- o   I can't judge

Question 10: Is there anything else you would like to add?

Quality Assurance in Blended and Online Education

Evaluating the quality of master's thesis supervision in academic distance education: Hellenic Open University students' perceptions

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Abstract

Master's thesis supervision constitutes a demanding task that requires mutual commitment and systematic cooperation of the involved parties (supervisors and students). Poor, ineffective supervision may often result in low completion rates among postgraduate students. In respect of the academic distance education context, many challenges can affect master's thesis supervision, such as lack of delicacy and depth in supervisor-student interactions, students' gradual isolation, and technological issues. The aim of the present study was to evaluate the quality of master's thesis supervision at the Hellenic Open University (HOU) according to students' perceptions. To this end, a survey with a sample of 1712 students was conducted. Quantitative data analysis revealed that students were satisfied with all supervisors' practices. Qualitative data analysis showed that students were mostly satisfied with the quality of communication with their supervisors as well as the feedback, guidance, support, and encouragement they received. Students suggested time extension and better management of master's thesis preparation.

Keywords

Master's thesis supervision, semantic network analysis, academic distance education, student's perceptions

1. Introduction

The knowledge-based economy forces universities to be systematically connected with markets and educate employable, adaptable, and high-quality graduates (Talos et al., 2019). As a result, university students nowadays, are forced by market demands to complex career expectations. They must be more qualified, competitive, and adaptable to changing situations. In such a context, postgraduate studies and postgraduate thesis supervision play a crucial role in the accumulation of knowledge and the productive capacity of a country (Manyike, 2017).

Master's thesis supervision constitutes a demanding task that requires mutual commitment and systematic cooperation between supervisors and students. Supervisors themselves should provide multifaceted support (Mhunpiew, 2013) and fulfill many roles such as mentors, friends, and consultants (Manyike, 2017). Poor, ineffective supervision that lacks these dimensions may often result in low completion rates among postgraduate students (Sidhu et al., 2020). In respect of the context of academic Distance Education (DE), many challenges may come to the fore, such as a lack of delicacy and depth in supervisor-student interactions, students' gradual isolation, and technological issues (Nasiri & Mafakheri, 2015; Zaheer & Munir, 2020). Although research on the evaluation of both master's and doctoral theses supervision has expanded gradually since the 1990s, research on master's thesis supervision is less explored (Filippou et al., 2017; Nasiri & Mafakheri, 2015), and especially research on supervisors' role (Harwood & Petrić, 2020).

The HOU is the only university in Greece which provides exclusively academic DE at both undergraduate and postgraduate levels. Regarding master's thesis preparation, the general categories of topics for a master's thesis are defined by the Study Program Director (SPD) in collaboration with the Module Coordinators (MDs). Students electronically submit proposals on topics of their interest. The proposed thesis can be theoretical, applied, or experimental. The SPD or the MC appoints two tutors as members of the Examination Committee (EC). One of them is assigned the role of the first supervisor and has the total responsibility for a student's master's thesis (e.g., subject's confirmation, provision of the relevant information, guidance and feedback, final approval). The time for master's thesis preparation is one academic semester for semi-annual postgraduate programs and the whole academic year for annual postgraduate programs. Students must submit their thesis to the EC in a predefined time period, using the Moodle Learning Management System. Upon EC's final approval, an oral presentation date is defined. Faculty members and/or researchers may be present as an audience during the oral presentation. The oral presentation usually takes place in face-to-face meetings, but since the Covid-19 pandemic, it has been conducted online. In order to ensure uniformity in master's thesis evaluation, HOU provides some general quality indicators that the EC should take into account, such as the presence of adequate methodology and structure, the original contribution to academic knowledge, and the meeting of academic writing standards and rules. ("Diploma Regulations-HOU," 2020).

Only last year, approximately 5.000 HOU students obtained a master's diploma following the abovementioned process. Nevertheless, despite the large number of graduates, to the best of our knowledge, no extensive research has been conducted so far to examine HOU students' perceptions of the quality of the supervision of a master's thesis. To this end, three research questions were formulated:

1. To what degree are HOU students satisfied with supervisors' practices?
2. What are students' views on the positive and negative aspects of master's thesis supervision?
3. What do students suggest for the improvement of master's thesis supervision?

2. Theoretical Framework

A master's thesis promotes analytical skills, decision-making, and organizing and delivering innovative content. Nevertheless, whether on campus or at a distance, master's thesis preparation is rather a solitary effort for the student, compared to the other courses in a master's degree program (Aghaee, 2015; Talos et al., 2019), and requires the development of autonomous learning (Olsson & Hallberg, 2018). According to the literature, many barriers can hinder students' postgraduate studies. However, a main reason for low completion or high attrition is often insufficient supervision (Sidhu et al., 2020). A crucial factor for a thesis' successful completion is the quality of supervisor-student interactions. As Filippou (2020) has shown, students' learning opportunities are increased when supervisors acknowledge the former's previous experiences and prior knowledge. Also, according to de Kleijn et al. (2012), students who receive more affiliation from their supervisors receive higher final grades and are more satisfied with the thesis supervision process. However, neither supervisors' roles are self-evident nor do they perform the same roles without exception. A supervisor may occupy different roles at different times and in line with the supervision model s/he follows (Harwood & Petrić, 2020). The expected roles and responsibilities of each party are highly conditioned by the mode of supervision that is followed, as well as the academic discipline's curricular focus and research style (Olsson & Hallberg, 2018).

Dysthe (2002) identifies three models of supervision: teaching, apprenticeship, and partnership. In the teaching model, the student produces work that he/she brings to the supervisor. The latter gives feedback on thesis drafts and often directions to proceed. It is an asymmetric relationship model where a supervisor is recognized as an authority whose primary role is only to correct texts. In the apprenticeship model, the student-apprentice observes the supervisor in a context and then performs similar operations. A student's thesis is usually part of a team project (e.g., tasks in a laboratory environment) which involves frequent group meetings where research data are presented and ideas are criticized and further elaborated. In the partnership model, symmetric relationships prevail in terms of the tasks to be done: thesis preparation is seen as a joint responsibility between the supervisor and the student, based on an exploratory orientation where feedback is open for negotiation. Regardless of the choice of a supervision model, the literature also highlights the importance of balanced dependency relationships between supervisors and students: students should not be completely independent in terms of their actions during supervision, as this may ultimately disorient them, but neither should they be completely dependent on the supervisors, as this limits the skills and initiatives to be developed during the thesis preparation (Agricola et al., 2021; Shanahan et al., 2015).

DE allows access to learning without the limits of physical location, it is flexible enough regarding space and time and provides individualized and self-paced learning. While DE was implemented for years, however, it came to the fore as a forced choice for many universities worldwide, due to the COVID-19 pandemic. This abrupt shift from in-person to distance learning was accompanied by many challenges for both faculty members and students (Faridah et al., 2021). Distance between supervisor and student in DE can be decreased with the use of ICT platforms that improve collaboration, communication, information, and accessibility (Aghaee, 2015; Karunaratne, 2018). Nevertheless, students might feel alone and thus withdraw from interaction with supervisors when the latter avoid building systematic and qualitative interactions with them. The distance between supervisor and student may result in a lack of good personal knowledge about each other and create a rather formal context for interaction. This has the danger of the student being less motivated and engaged in valuable conversations with his/her supervisor. Furthermore, the distance between supervisors and students may result in a reduction in the

frequency and quality of their feedback (Zaheer & Munir, 2020). In DE, almost all feedback can be given electronically and this can easily lead to misunderstandings. So, supervisors must be in the position of checking whether students have comprehended their feedback or not (Heeralal, 2015). What is more, the complete lack of face-to-face interactions may dissatisfy students (Zaheer & Munir, 2020), and an optimal blend of face-to-face and synchronous/asynchronous contacts is often required for effective supervisor-student communication (Nasiri & Mafakheri, 2015).

3. Method

3.1 Research design and participants

A survey design was conducted in order to collect students' opinions and explain trends in their answers (Bryman et al., 2021). The survey was conducted by the Internal Evaluation Unit of HOU during the academic year 2020-2021. A total of 1712 (30%) out of 5719 students participated voluntarily and anonymously in the survey. More specifically, 614 students from the School of Humanities, 303 students from the School of Sciences and Technology, 768 students from the School of Social Sciences, and 27 students from the School of Applied Arts participated.

3.2 Data collection and analysis

Students were asked to fill out anonymously a short questionnaire with 15 questions (12 close-ended and 3 open-ended) before their thesis presentation/defense. Close-ended questions were used in order to capture students' satisfaction with the supervisor's practices (e.g., literature provision, guidance, feedback, encouragement, etc.- see Table 1). Open-ended questions were employed in order to capture students' comments on positive and negative aspects of master's thesis supervision as well as their suggestions for its improvement. Descriptive statistics were used for the analysis of quantitative data. 95% Confidence Intervals (CIs) of mean values (M) were calculated by the bootstrap method (1000 bootstrap samples).

Semantic network analysis was applied to qualitative data to detect several themes (Segev, 2021). First, text preprocessing was done according to the following two steps: a) word tokens' lemmatization and b) frequently-used words' removal (Jo, 2018). A corpus of 2817 sentences resulted from text preprocessing (positives =2039, negatives = 275, improvements = 503). Then word cooccurrence matrices were created from corpus sentences and converted to word networks. To find clusters/ themes in word networks, the edge-betweenness community detection method was applied (Newman & Girvan, 2004). Words that frequently cooccur with many other words, are words with a high degree of centrality (represented by large node size) and help to interpret themes in the text corpus. The width of network ties indicates the frequency of each pair of cooccurring words in the text corpus. Also, black-colored ties represent pairs of cooccurring words in the same cluster. For readability reasons, node labels have been accompanied by their translation into English (see Figures 1-3). Both quantitative and qualitative analyses were carried out in the R statistical environment.

4. Findings and discussion

1.1 Quantitative findings

Quantitative data analysis showed that students were satisfied with all supervisors' practices during their master's thesis supervision, with mean values ranging above 4 (Table 1).

Table1. Quantitative results of students' satisfaction with the supervisor's practices

Items	N	1. Not at all satisfying (%)	2. A little satisfying (%)	3. Satisfying (%)	4. Very satisfying (%)	5. Very much satisfying (%)	M	SD	95% CI of M
1. Supervisor's contribution to the explanation of the master's thesis topic	1707	1.3	1.6	5.1	18.1	73.9	4.61	0.77	[4.58, 4.65]
2. Supervisor's contribution to the finalization of the master's thesis objectives	1703	1.6	1.3	4.3	17.3	75.5	4.63	0.77	[4.60, 4.67]
3. Supervisor's contribution in the search for literature/information resources	1704	2.1	3.3	11	21.7	62	4.38	0.94	[4.34, 4.43]
4. Supervisor's contribution to the finalization of the master's thesis research methodology	1700	1.5	1.6	6.7	18.9	71.2	4.57	0.81	[4.53, 4.61]
5. Supervisor's contribution to the formation of clear milestones for deliverables according to the deanship regulation	1697	1.4	1.5	5.2	16.7	75.2	4.63	0.77	[4.59, 4.67]
6. Supervisor's consistency regarding the timely feedback of draft submissions	1699	1.6	1.6	4.2	13	79.6	4.67	0.77	[4.63, 4.71]
7. Clarity of the supervisor's feedback	1699	1.2	1.6	3.8	14.5	78.9	4.68	0.73	[4.64, 4.71]
8. Supervisor's contribution to the development of the required research skills	1685	1.9	1.7	8.4	19.8	68.2	4.5	0.87	[4.46, 4.55]
9. Supervisor's contribution to the organization of the supervision process	1691	1.4	1.7	7.2	17.7	72	4.57	0.81	[4.53, 4.61]
10. Communication with the supervisor (via online meetings, phone, e-mail, etc.)	1692	1.7	1.5	4.8	12.1	79.8	4.67	0.78	[4.63, 4.7]
11. Supervisor encouragement to complete the master's thesis	1693	1.8	1.8	4.2	13.9	78.3	4.65	0.8	[4.61, 4.69]
12. Overall impression from the collaboration with the supervisor	1694	1.9	1.1	4.2	13.9	78.9	4.67	0.77	[4.63, 4.70]

More specifically, HOU students tend to be more satisfied with the clarity of supervisors' feedback, their timely response, the encouragement they provided, the supervisor-student communication in general, as well as the overall impression they had on supervisors. They seemed to be less satisfied with the supervisor's contribution to the search for relevant literature. These results are in line with similar findings in the literature concerning effective supervision practices. Mushoriwa and Nyakutse (2014) report in their research that master's degree students were satisfied with their supervisors when the latter provided clear comments, offered specific guidance, showed interest in students, encouraged them to work steadily, and were always available for consultation. According to Taylor & McCulloch (2017), effective supervisors are available, supportive, approachable, and offer high-quality guidance. Also, they enable students to acquire research skills and give prompt feedback. Finally, according to Mhunpiew (2013), effective supervisors guide students in structuring their thesis, help them to plan/manage time, guide them to read documents and research related to the thesis topic, are aware of guidelines, and set common goals with students.

4.2   Qualitative findings

Positive comments
Regarding the positive comments, six clusters (C1-C6) resulted from the semantic network analysis (Figure 2). More specifically, students mentioned that communication and cooperation with their supervisors were good, perfect, excellent, and prompt (C1). They also stressed that supervisors' response to their questions was immediate (C4). Supervisors' written feedback was mostly immediate, clear, and prompt (C5). Students expressed their positive feelings about the quality of the guidance (C2) as well as the continuous encouragement and support they received from supervisors (C3). Finally, students stressed the scientific expertise of supervisors in their area of study (C6). Indicative comments follow below in Table 2.

Table 2. Themes and indicative comments on the positive aspects of master's thesis supervision

Clusters	Themes	Indicative comments
C1, C4	Effective communication & cooperation	*'Excellent cooperation, substantial interest in the scientific result, constructive discussions, honest and human communication'*
C5	Effective feedback	*'His feedback was clear and detailed word-by-word, always written with respect and courtesy'*
C2, C3	Provision of guidance, encouragement & support	*'The supervisor contributed significantly with his encouragement and guidance to the completion of the thesis'*
C6	Supervisors' scientific expertise	*'Supervisor's knowledge and scientific training helped me to complete my thesis'.*

Findings almost similar to the above themes were identified in the literature review. Hajar & Mhamed (2021) mention that students in their study appreciated those supervisors who arranged face-to-face meetings, gave detailed written feedback, and provided clear deadlines, and stage-by-stage guidance. Heeralal (2015) reports in his research that timely and detailed feedback from supervisors was highly appreciated by students. In the research of de Kleijn et al. (2012), supervisors' emotional involvement with students motivates the latter to work harder on their thesis, deliver high-quality work and feel satisfied with their supervision process. According to Sidhu et al. (2020), supervisors are highly appreciated by their students when they are experts in their area of study, so as to provide expert knowledge and guidance on research. Furthermore, students appreciate supervisors who treat them as co-researchers and motivate them to complete their studies.

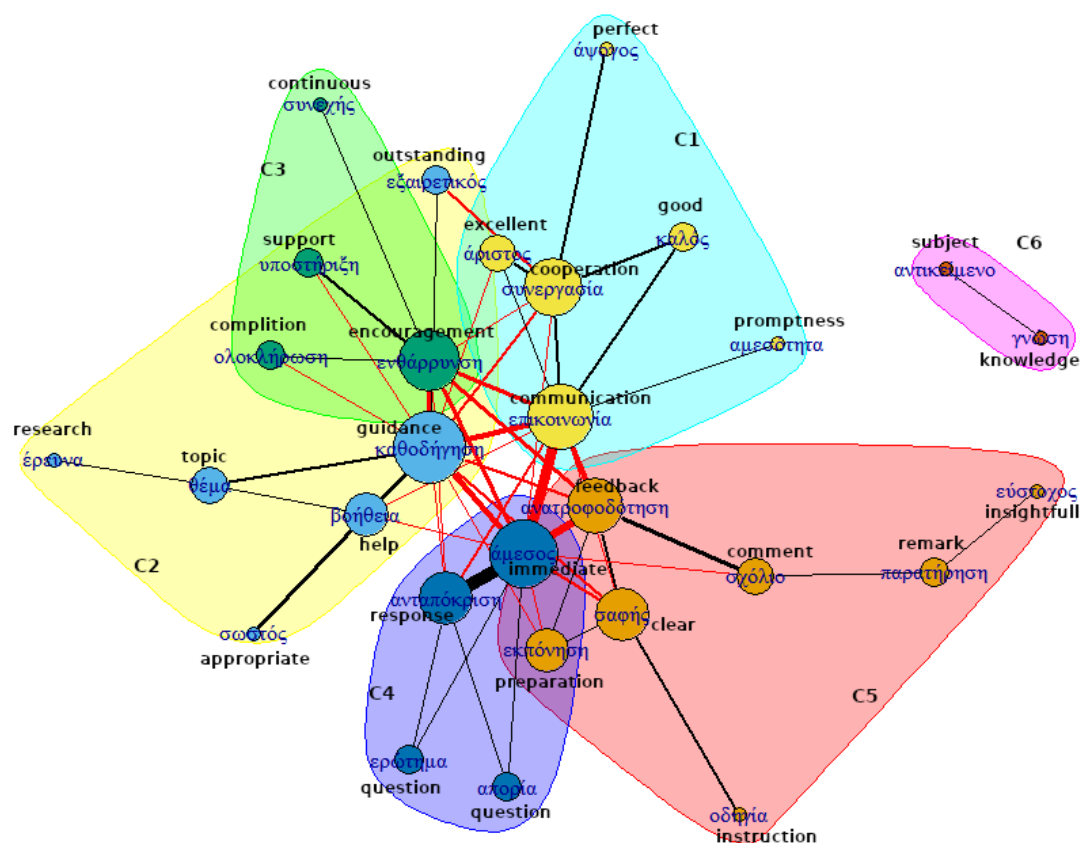Figure 2. Semantic network of students' positive comments on master's thesis supervision.

Negative comments

Four clusters (C1-C4) resulted from the semantic network analysis of students' negative comments on master's thesis supervision (Figure 3). Students complained about the quality of communication with their supervisor, reporting mostly communication difficulties, delayed responses or lack of response at all,

inconvenient contact hours by phone, and reluctance to communicate with students. Students also stressed that these communication issues resulted in some cases of time loss and delays in the schedule (C1). In addition, students complained about the absence of valuable face-to-face meetings with their supervisors, a fact for which they do not hold the latter entirely responsible but attribute it mostly to the health measures that had to be followed due to the COVID-19 pandemic (C2). Another theme concerned the lack of support in literature research and information related to the thesis topic (C3). Finally, students complained about incomplete or absent written feedback on their texts (C4). Indicative comments follow in Table 3.

Table 2. Themes and indicative comments on the negative aspects of master's thesis supervision

Clusters	Themes	Indicative comments
C1	Communication problems	*'There was a lack in communication and irregular communication hours'*
C2	Lack of face-to-face meetings	*'The most negative aspect was that, due to the COVID-19 circumstances, there was no personal, face-to-face meeting'*
C3	Lack of help with literature search	*'The only negative comment I have to make is that the supervisor did not help me much in searching for literature and relevant information resources'*
C4	Inefficient feedback	*'I did not receive the corrections I should have received so that I would not make the same mistakes again'*

Filippou et al. (2017) mention that students consider supervisors are responsible for frequent communication, regular meetings, emotional support, and guidance. Schulze (2012) mentions that supervisors who are distant may disempower students with low search self-efficacy. Zaheer and Munir (2020) mention that the lack of face-to-face interactions may dissatisfy students. Neupane Bastola (2022) refers to barriers to the quality of supervision due to supervisors' actions, such as incomplete or absent feedback, rare meetings with students, and incomplete reading of their thesis. Hajar and Mhamed (2021) and Sidhu et al. (2020) refer to students' dissatisfaction due to late or brief feedback that was not sufficient to guide them, as well as due to the lack of support in general. Finally, Schulze (2012) mentions that long waiting periods for feedback are perceived by students as frustrating.
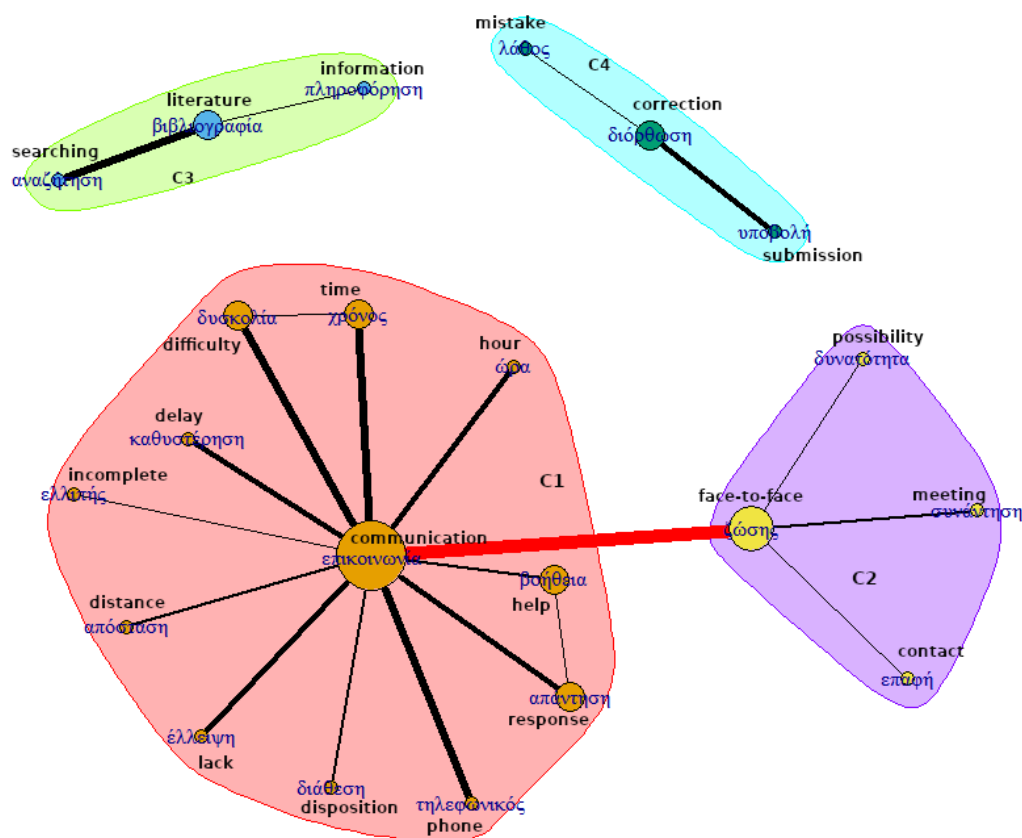
Figure 3. Semantic network of students' negative comments on master's thesis supervision

Suggestions

Six clusters (C1-C6) resulted from the semantic network analysis of students' suggestions on master's thesis supervision (Figure 4). Students want more time to prepare and write their thesis (C1), either from the beginning of the process or at several stages (e.g., in the time period of finalizing their thesis after EC's comments) The issue of time was not only raised in the context of the time extension of thesis' preparation but also in the context of supervision's organization and management: students mostly suggested that specific deadlines for supervisors to respond to questions should be set from the beginning of their cooperation, specific dates for the delivery of thesis' parts should be set, student feedback should be given at more regular intervals, and tutors should be assigned for supervision on time (C2). Students proposed the conduct of consultative meetings with their supervisors (mainly face-to-face but also online) to discuss the progress of their thesis (C3). Regarding the thesis' topic, students requested the search and final selection of the topic to be done earlier (from the beginning of the academic year) and in cooperation with the appropriate supervisor. Also, there should be a wider range of topic areas to choose from, greater freedom in the choice of topic, better guidance from the supervisor in the choice of a topic, better support from the supervisor in the search for relevant literature, and provision of appropriate and richer literature by the HOU (C4). Finally, students mostly want prompt communication with supervisors (C5), and good and timely information on the stages of thesis supervision (C6). Indicative comments follow in Table 4.
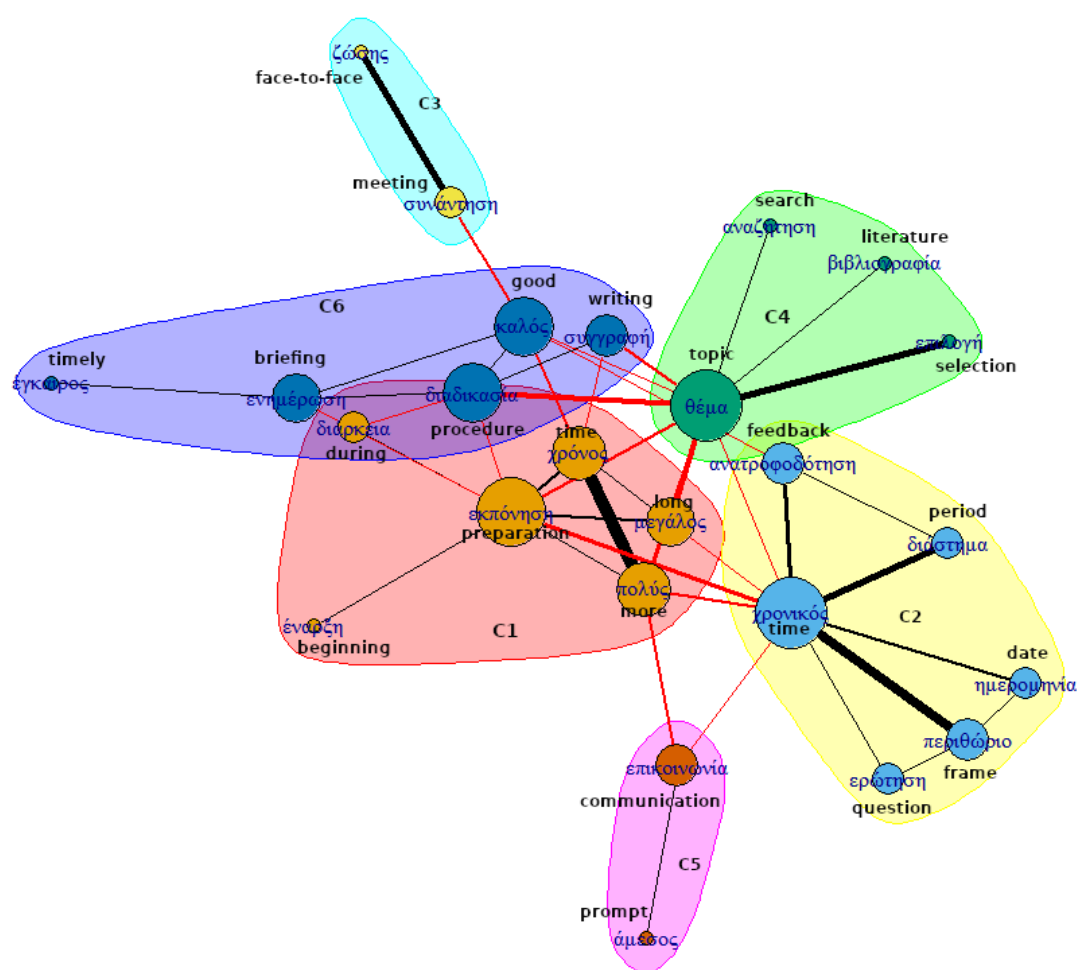
Figure 3. Semantic network of students' suggestions on thesis supervision

Table 4. Themes and indicative comments from students' suggestions on master's thesis supervision

Clusters	Themes	Indicative comments
C1	Time extension	*'The preparation time should be longer from the beginning'*
C2	Effective organization and management of supervision	*'The student should send pieces of his/her work at regular time periods and the supervisor should give the relevant feedback'*
C3	More meetings	*'Meetings and video conferences [need to be done] in order to promote the maximum possible communication between students and supervisors'*

C4	Support on topic selection	*'I believe that more weight should be given to the selection of the thesis topic together with the supervisor and the student'*
C5	Prompt communication	*'More prompt communication'*
C6	Better information	*'Better and above all, timely administrative information on procedures and deliverables'*

In line with the above findings, Heeralal (2015) states that for supervision to be effective, students and supervisors need to agree early on their expectations regarding the methods of communication (e.g., email, phone, etc.), the frequency, and the reading and writing requirements. Students need to be supported in planning their thesis and also need pastoral care. It's very crucial for students that supervisors should be allocated as early as possible because this helps them build an agreement and good trust from the initial stage of their thesis preparation (Heeralal, 2015). According to Filippou et al. (2017), students want their supervisors to follow the entire thesis process, motivate and guide them to overcome several problems, give them constructive feedback and tell them whether their plans are realistic or not. In a study conducted with both supervisors and students regarding their responsibilities, Olsson & Hallberg (2018) mention that the establishment of the theoretical framework of the thesis was considered a mutual responsibility of supervisors and students. Also, both supervisors and students tended to credit supervisors with more responsibility for providing resources that would support students' findings. Both agreed that the organization of regular meetings with their students is predominantly the supervisors' task. Additionally, supervisors have the responsibility to make students aware of the resources and facilities available at the university. Maintaining an effective relationship between supervisor and student was considered a mutual responsibility of both participants. In Schulze (2012), students regarded the provision of relevant articles as a genuine interest on the part of their supervisors, even though it was not considered the responsibility of the latter. Finally, Nasiri & Mafakheri (2015) stress that an optimal blend of face-to-face and synchronous/asynchronous contacts is often required for effective supervisor-student communication.

4 Conclusions and recommendations

The aim of the present study was to evaluate the quality of master's thesis supervision at the HOU according to students' perceptions. The research was conducted by the Internal Evaluation Unit of HOU. A total of 1712 students responded to the close-ended questions of the questionnaire and 2817 sentences resulted from the processing of the open-ended questions (positives =2039, negatives = 275, improvements = 503). Quantitative results showed that students were especially satisfied with the clarity of supervisors' feedback, their timely response, the encouragement they provided, the supervisor-student communication in general, as well as the overall impression they had on supervisors. Regarding qualitative results, students' positive comments focused mostly on effective communication & cooperation with supervisors, effective feedback, as well as guidance, encouragement, and support they received. Students' negative comments mostly stressed problems in their communication with supervisors (e.g., delay in

responses, reluctance to communicate, inconvenient contact hours). Students mostly suggested time extension and better organization and management of thesis preparation (e.g., supervision assignment on time, binding deadlines for deliverables, and regular feedback).

Although HOU library provides students with guides for thesis preparation as well as specifications for writing and presenting their thesis, to better improve the supervision process, HOU should organize orientation seminars per school of study for both supervisors and students to enhance supervisors' capacities, sharpen students' research skills and cover issues with library and ICT resources. What is more, it is important in these seminars to clarify both parties' roles and expectations regarding the ways and the frequency of supervisor-student communication, the evaluation criteria and the feedback to be provided, and the milestones and deadlines for deliverables to be followed (Hajar & Mhamed, 2021).

The present survey has limitations. The analysis was conducted without further investigating possible differences in students' perceptions, based on demographic characteristics such as gender, age, and school of study. Also, the study explored only students' perceptions. It would be of particular interest to explore supervisors' views of how they perceive effective supervision and compare them with students' perceptions to identify possible convergences and divergences that will help to improve the supervision process in HOU.

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Open Universities and International Rankings: an incompatible (?) relationship

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Abstract

Over the last twenty years, rankings have been constantly evolving in terms of their geographical scope (global, regional, local), their specific objectives (sustainability, business school rankings, sport science, etc.), their sources of funding (public, private) and, above all, the methodology they adopt -recognizing their shortcomings, especially of the first generation. In relation to the latter the interesting thing is that, apparently different in size, objectives and content, institutions seem to be compared as if they were similar. In this context, in this paper, we capture the changes related to the fourth phase of the evolution of rankings (2008-) and raise concerns about the extent to which the methodology of the ranking systems can respond to the profile and specificities of open universities - using the Hellenic Open University (HOU) and the Open University of Cyprus as case studies. The findings of our investigation show that the positions occupied by open universities in international classifications cannot be considered at all random given the criteria adopted.

Keywords: internationalization of HE, international rankings, comparative approach, higher education.

1. Introduction: The global rankings

Rankings[1] have been around for over a century[2] (Hazelkorn & Mihut, 2021). Global ranking systems, on the other hand, count, about 20 years of life (Stamelos et al., 2015). Their

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[1]The terms classifications and rankings will be used synonymously in this section. According to the "iREG Guidelines for Stakeholders of Academic Rankings" (2015): *Academic rankings are a numerical assessment of the performance of a program, activity, institution or higher education system, based on an agreed methodology. One-dimensional rankings evaluate performance according to a set of indicators, with a specific weight assigned to each specific indicator. Multidimensional rankings provide a series of score tables rather than just one overall table. This allows users to weight the indicators according to their own preferences and construct personalized rankings. A ranking requires a set of at least two indicators with an assigned percentage weight - there are, however, cases where stakeholders define the emphasis themselves. The choice of indicators and their weighting reflects the authors' concept of the quality of the institutions or programmes they have chosen to rank* (iREG Observatory, 2021, p. 9).

[2] The practice of ranking universities dates back to around 1900 with the publication in England of the book Where We Get Our Best Men. This study examined the background of the most prominent and successful men in the country at that time with particular reference to where each studied, and

presence has marked the different role and importance of universities in what is now an international marketplace of 'eminent' institutions and scholars. It underlines the positioning of higher education and research and development (R&D) at the centre of the global economy and geopolitics, at the same time as the increasing need for international comparability, evaluation and accountability of higher education institutions (Hazelkorn, 2018).

The development of rankings can be broadly divided into four main phases, each of which reflects the changing landscape of higher education and research at the level of the university (Hazelkorn, 2015; Marope et al., 2013):

- Phase 1 (1900-1950): a search for the educational backgrounds of 'eminent men' in excellent universities, which is then extended to examine broader issues of institutional excellence.
- Phase 2 (1959-2000): rise of commercially driven rankings centered on reputational factors in response to increasing massification, student mobility and the commercialization of higher education[3].
- Phase 3 (2003-): emergence of global rankings reflecting globalization and global competition, as well as the strengthening of the international academic and professional labor market[4].
- Phase 4 (2008-): emergence of supranational/multinational rankings in response to growing concerns about the need to regulate and monitor quality, credentials and the increasing number of supranational and private providers[5].

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therefore provided a list of universities ranked by the number of distinguished graduates they could claim (Myers & Robe, 2009, in Marope et al., 2013).

[3] The general indifference to university rankings began to change in 1983 with the publication of America's Best Colleges by US News and World Report. For the first time, information about the undergraduate programs of American institutions of higher education became widely and publicly available to the nation's student population and their parents through a widely distributed popular medium. A decade later, in 1993, the first Times Good University Guide was published in the United Kingdom, sparking - as had previously happened in the United States - a public debate about which institutions had a better or worse place in the guide. The 1990s saw the appearance of a variety of directories, league tables and rankings around the world, numbering everything from specialist subject schools, to MBA programmes and private institutions, causing, as a result, increasing controversy and struggle for places on these lists, as well as scepticism from the institutions that did or did not appear on them (Marope et al., 2013).

[4] The Academic Ranking of World Universities (ARWU) was launched by Shanghai Jiao Tong University in 2003. It was a response to the ambitious agenda set by the Chinese government to create world-class universities. ARWU was a means to highlight the gap between Chinese and other universities and thus help identify criteria for excellence. This was quickly followed by Webometrics (created by the National Research Council of Spain), and the THE-QS (THE-QS) global university ranking in 2004, and many others in the following years (see also https://ireg-observatory.org/en/, accessed 05.03.2022). Success was immediate, gaining media and policy attention (Marope et al., 2013; Hazelkorn, 2009).

[5] Understanding of the inadequacies of the first-generation classifications (despite their social acceptance) gave impetus to the creation of a new generation of classifications. Such cases are U-Multirank and AHELO. U-Multirank claims to be the European answer to the simplistic rankings of the first generation. Its conception is interesting because it subverts many of the principles of rankings (Van Vught & Ziegele, 2011). To begin with, it does not propose a final classification. Then, it wants to rely on the interaction of different categories of stakeholders (e.g., students, families, faculty, institutions, professional bodies, etc.). Thus, it lets the stakeholder choose from a number of different proposed variables those that really interest him/her, ultimately proposing a comparison of the institutions under selection, without ranking. In this way, someone who is looking for initial studies can use some of the

Rankings today are constantly evolving in various, basic, levels, such as the geographical scope of their application, the scope of comparison - institution or specific fields of study - and the specialized scope of their interests, but also in other separate fields[6]. In particular, in the geographical scope of their application we find, first of all, the most familiar global rankings (ARWU, QS, Times Higher Education, etc.), rankings that refer to specific regions of the world (Arabian Peninsula, Latin America, Asia, Europe and Central Asia, developing economic countries) and others that do not refer to universities but to national higher education systems (QS Higher Education System Strength Rankings and U21 Ranking of National Higher Education Systems). As regards the subject of studies, in recent years, rankings refer to comparative studies, business schools, sport science rankings, etc. Finally, some rankings focus on individual specialized subjects, such as Greenmetric which emphasizes sustainable development or the Nature Index which emphasizes universities that collaborate with high quality science journals or, finally, the Web of Universities Ranking (Webometrics) which highlights a university's presence on the web (iREG Observatory, 2021). Beyond that, the rankings may differ in terms of the origin of funding, the target population, the body implementing the ranking and even the methods of quality assurance and, of course, the methodology for conducting the ranking[7].

In relation to the latter in particular, the interest lies in the fact that institutions that are obviously different in size, mission and objectives seem to be compared as if they were similar. This is precisely where the interest of this study lies: we will be concerned with the characteristics (methodology) of the global rankings -as included in the iREG Observatory[8]

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proposed variables (e.g., student life, student support, student-teacher ratio, graduation rate, etc.) in comparison to someone else looking to do a PhD who would be more interested in, for example, the scope and quality of research, collaboration with the workplace or with large companies, etc. At the other extreme, an employer would be interested in other variables, depending on whether they are looking for a first or third cycle graduate. Thus, the user, who defines the variables himself, ends up with a comparative table of institutions in the countries he has defined and is interested in. Interestingly, at its presentation in Athens in 2014, during the Greek Presidency of the Council of the EU, the criticism levelled at it, particularly by non-European experts, was that it was an extremely complex classification system requiring specialised knowledge and therefore its failure was presumed. With regard to the OECD's AHELO, the focus is on learning outcomes and the focus is on student-centred learning and research into the teaching-learning process. AHELO uses the Tuning methodology to develop its tools, dividing competences into generic and subject specific competences, implementing a pilot global survey in economics and engineering. In addition, it addresses three different groups of stakeholders: students, academics and employers. What is interesting about the AHELO effort is that it departs from the logic of traditional classifications by constructing a complete, comprehensive and specific questionnaire that tests learning outcomes alone. Thus, it essentially accepts the position that the idea that one can classify all institutions on the planet based on 4-5 indicators is not feasible (Stamelos et al., 2015)

[6] There are currently around 25 global rankings - although their level of activity varies - and, at a rough estimate, over several hundred rankings based mainly at the national level (Hazelkorn & Mihut, 2021).

[7] But these characteristics will be discussed later in the paper.

[8] To be included in this list, a ranking must meet the following criteria: a. includes two or more indicators or criteria, -based on at least one indicator or measure that measures a university's core missions: teaching, research and innovation, b. has been published at least twice; the latest edition was published in 2018 at the earliest, c. included at least 100 universities from at least two countries (the exceptions have been made for rankings of business schools, which can include less than 100 programs), d. its website provides (in English) information on the sources of the data, the weight of indicators, as well as normalization, standardization, and the treatment of outliers, e. results and scores of all indicators are accessible on the Internet (iREG Observatory, 2021, p. 9).

2021- and, above all, the extent to which they correspond to the specific characteristics and profile of open universities - with an emphasis on the key features and profile of the Open Universities of Greece and Cyprus.

The aim, our focus, is to raise concerns on the extent to which the methodology of classification systems may respond to the profile and specificities of open universities - using the Hellenic and the Open University of Cyprus as case studies - and, ultimately, to raise concerns on the extent to which they constitute a reliable indicator of the quality of Higher Education Institutions.

2. The basic (methodological) characteristics of international university rankings...

In this section we are interested in highlighting the key (methodological) characteristics of the 15 global university rankings included in the iREG Observatory (2021). All are stand-alone/independent rankings, freely accessible online -without excluding other forms of publication of the data they contain, and published annually -with the exception of Webometrics which is published on a semi-annual basis.

Beyond these common characteristics, however, they appear to differ, initially, on a number of other levels (see table 1). First, they differ in the number of institutions they compare. The Reuters Top 100 ranking reports the top 100 institutions based on the fields it compares, while on the other hand within Webometrics 31,000 institutions are compared. Most international rankings (8), however, compare 1000-2000 institutions[9]. At a second level, international rankings of universities differ in the level of methodology followed to ensure the quality of the services they provide: the vast majority of rankings (10 cases) state that an advisory board is responsible for quality assurance, while four cases[10] also state that periodic consultations take place to ensure quality. Finally, it is interesting to note that two of the organizations that organize international rankings have arranged to obtain certification from PwC. At a third level, it is important to mention the type of organizations that organize international rankings[11]: three organizations are associated with universities, two are private, non-profit organizations, one is a public research body and eight are commercial for-profit organizations.

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[9] It is worth mentioning, in light of this finding, that a key criticism of international classifications is that they compare 1%-3% of higher education institutions (Pavel, 2015; Marope et al., 2013; Rauhvargers 2011, 2013).

[10] The adoption of this method of quality assurance does not exclude the presence of an advisory committee or other methodology.

[11] U-Multirank is developed and implemented at the initiative of the European Commission by an independent consortium led by the Centre for Higher Education (CHE) in Germany, the Centre for Higher Education Policy Studies (CHEPS) at the University of Twente and the Centre for Scientific and Technological Studies (CWTS) at Leiden University, both in the Netherlands, and the Foundation for Knowledge and Development (Fundación CYD) in Spain. Collaborating partners include specialised organisations (e.g., data collection, web design), national ranking bodies and stakeholder organisations (https://www.umultirank.org/about/u-multirank/the-consortium/, accessed 25.08.2022).

Table 1: Basic characteristics of global rankings (iREG Observatory, 2021)

	Name of the ranking	No. of institutions compared	Quality assurance of ranking	Type of organization
1	CWTS Leiden Ranking	1176	principles for responsible use	university
2	CWUR World University Rankings	2000	advisory boards	private, non profit
3	MosIUR	1500	expert council certification - independent audit by PwC periodic consultancy	private, non profit
4	Nature Index	500	advisory board	commercial for profit
5	NTU Ranking	826	periodic consultancy advisory board	university
6	QS World University Rankings	1003	advisory board certification	commercial for profit
7	Webometrics	31000	advisory board	public research organization
8	Reuters Top 100	100		commercial for profit
9	RuR	829	advisory board	commercial for profit
10	SCImago Institutions Ranking	3897	advisory board periodic consultancy	commercial for profit
11	ARWU	1000	advisory board	commercial for profit
12	The World University Rankings (Times HE)	1527	certification - independent audit by PwC	commercial for profit
13	U-Multirank	1788	advisory board	private (non-profit) - CHE; University - CHEPS; CWTS
14	URAP	3000	advisory board	non-profit research lab established in a university
15	US News Best Global University Rankings	1500	periodic consultancy	commercial for profit

Table 2 shows the main indicators used in international rankings. The study of the table confirms the criticisms that have been made concerning international rankings over the years: All global rankings use broadly the same data sources and operate according to the same methodological rubric, with a focus on research and university reputation (Hazelkorn & Mihut; 2021). Given the absence of reliable publicly available cross-national comparative data, global rankings (are forced to) measure research in broad terms rather than the full range of higher education institutions' activity. As such, they rely heavily on traditional research outputs, as captured in the bibliometrics and citation databases developed by either Thompson-ISI or Elsevier-Scopus - and are mainly English-language. Research productivity is measured by the number of publications in peer-reviewed journals, while research excellence and impact are

measured by the number of citations. Essentially, publications and citations attempt to measure the extent to which research impacts the global scientific community (Nyssen 2018)! In short, there is a strong bias - expressed through the use of specific 'narrow' criteria - in favor of research universities and the English language and less attention is paid to good teaching and learning practices or to the regional engagement of universities (Stamelos, 2016; Kladis, 2014; HEPNET, 2013).

Nonetheless, all universities in the international context are examined and evaluated, and seek their place, explicitly or implicitly, through this prism of quality, which takes little account of other potentially favorable dimensions of their operation nor of any historical, cultural or other conditions related to the context of the universities or the emphasis they place on the disciplines they treat (Stamelos et al. 2015; Rauhvargers 2013; HEPNET, 2013; Rodríguez 2013; Salmi 2009; UNESCO 2009; Saisana & D'Hombres 2008; Santiago et al. 2008; Santiago et al. Marginson & van der Wende 2007, 2009; Altbach 2006). Indeed, the existence of a variety of rankings - for every taste - allows universities to choose the ranking where their position is favorable in order to achieve the desirable visibility that such an initiative can offer them.

Table 2: Major dimensions covered per ranking (iREG Observatory, 2021)

	Name of the ranking	Major dimensions covered
1	CWTS Leiden Ranking	internationalization research
2	CWUR World University Rankings	employability research teaching
3	MosIUR	teaching web presence research internationalization social impact
4	Nature Index	research collaborations in high-quality natural science journals
5	NTU Ranking	research
6	QS World University Rankings	employability internationalization reputation research teaching
7	Webometrics	research web presence reputation community engagement
8	Reuters Top 100	innovation research
9	RuR	teaching research international diversity financial sustainability
10	SCImago Institutions Ranking	innovation knowledge transfer research social engagement web presence
11	ARWU	research
12	The World University Rankings – Times Higher Education (THE)	internationalization research knowledge transfer reputation teaching

13	U-Multirank	internationalization research knowledge transfer teaching regional engagement
14	URAP	internationalization research
15	US News Best Global University Rankings	reputation research

3. ... and the ranking of Open Universities in the international classifications

The establishment and development of open, distance learning institutions has always followed the specificities and needs of each country and the local academic environment. The differences between institutions may be significant but in many cases national open universities have followed the British model as a whole (Hellenic Open University, Dutch Open University) or its basic characteristics (German Distance Learning University) or even, while adopting its central philosophy, have followed an opposite course (Catalan Open University) or simply a different course due to historical circumstances and social choices (French National Centre for Distance Education) (Lionarakis, 2010).

The German Distance Learning University, for example, was founded serving three main objectives: To contribute to the reform of higher education in the country, to develop the infrastructure for continuing lifelong learning based on the needs of the market, to facilitate access to higher education. The policy of continuing lifelong learning in Portugal has brought the Open University closer to the social needs of the country, thus redefining the offer of higher education for people who had abandoned their studies for various reasons. The Spanish National University of Distance Education (UNED) was founded in 1972 and is a public university. It has exactly the same legal status as all other conventional universities in the country. It is based on the modular system of education and has a specificity from other European open or distance universities. While the core body of students follows the criteria of conventional universities for admission to the institution, there is the Open Courses system that allows people without formal qualifications to follow modules of curricula without obtaining a degree.

What can be seen in the development of open and distance learning universities is the adaptation of what started out as second-chance higher education institutions to the new conditions of the labor market and scientific specialization. It also reveals the concept of 'openness' and the way in which it has shaped the strategies of these institutions. The concept of 'openness' is defined in terms of the opportunities offered, accessibility and the conditions of access that prospective students have when they do not have the formal qualifications. Indeed, if we look at the open universities that have been established over the last twenty years, we can see that their strategy in terms of open access and the logic of the development of their new programmes have followed more modern options, with the result that these options are closer to the needs of the labor market (Lionarakis, 2010).

In the context outlined above, in relation to the basic methodological features of the international classifications, it is important to see, at this point, how the position of European open universities[12] is reflected in them. As we have already mentioned, our aim is to raise our

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[12]Members of EADTU in the category: non-profit Open & Distance teaching Universities (https://eadtu.eu/index.php/members, accessed on 06.10.2022).

concerns in relation to the extent to which the methodology of the classification systems can respond to the profile and specificities of open universities.

Table 3 reflects the ranking of Open Universities in the 15 international university classifications included in the iREG Observatory (2021).

Table 3: Ranking of Open Universities in international university classifications (iREG 2021)

	OPEN UNIVERSITEIT - NETHERLANDS	ANADOLU – TURKEY	FERN IN HAGEN - GERMANY	UNIDISTANCE SUISSE	THE OPEN UNIVERSITY - UK	UNIVERSIDADE ABERTA - PORTUGAL	OU CATALUNYA	JYU[13] - FINLAND	UNED SPAIN	UNINETT UNO - ITALY	HOU	OPEN UNIVERSITY OF CYPRUS
CWTS Leiden Ranking[14]												
CWUR World University Rankings	x	1768	x	x	817	x	1575	585	1261	x	x	x
MosIUR	x	1101-1200	x	x	901-1000	x	1501-1650	651-700	x	x	x	x
Nature Index												
NTU Ranking	x	x	x	x	901-950	x	x	701-750	x	x	x	x
QS World University Rankings	x	1001-1200	x	x	x	x	x	358	x	x	x	x
Webometrics	1185	1283	1765	x	423	3420	784	486	741	3618	1621	3396
Reuters Top 100	x	x	x	x	x	x	x	x	x	x	x	x
RuR	x	x	x	x	x	x	x	307 (BL)	x	x	x	x
SCImago Institutions Ranking	677	672	751	x	574	760	618	550	572	638	739	726
ARWU	x	x	x	x	601-700	x	x	701-800	x	x	x	x
The World University Rankings (THE)	x	1201+	x	x	601-800	x	601-800	x	x	x	1201+	x
U-Multirank												
URAP	x	1780	2728	x	x	x	1826	606	x	x	x	x
US News Best Global University Rankings	x	1378	x	x	718	x	x	556	1247	x	x	x

The performance indicators[15] of the European open universities included in the u-multirank ranking for 2022 are shown in the following graph -graph 1.

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[13] JYU Open is an integral part of the University of Jyväskylä which is a well-established University in Finland -founded in 1863 (see the annex).

[14] The data provided from CWTS Leiden Ranking and Nature Index are not suitable for inclusion in the particular table.

[15] These refer to teaching and learning (green colour), research (pink), knowledge transfer (green), international orientation (yellow) and regional engagement (purple).
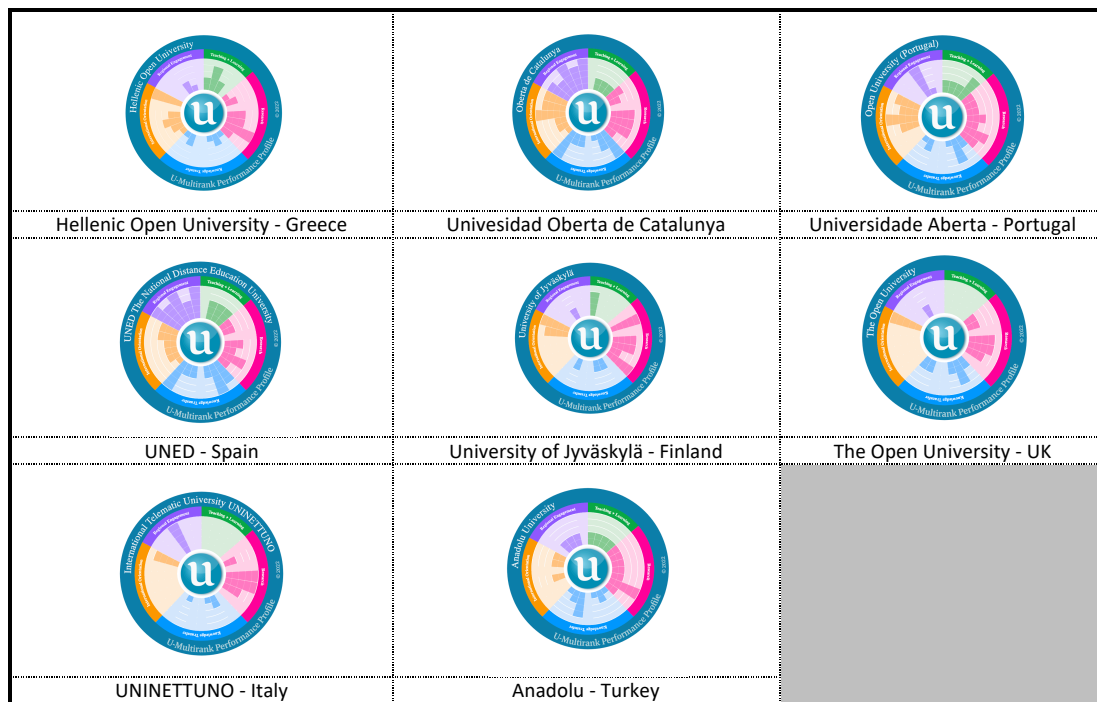
Figure 1: Performance indicators of the European Open Universities included in the u-multirank ranking (https://www.umultirank.org/)

What is striking, first of all, is the fragmentary inclusion - or not - of European universities in the global rankings - with the exception perhaps of the webometrics and SCImago rankings, which, however, specialize in the web visibility of universities. At a second level, we must highlight the different places of European Open Universities in the different world rankings, given the diverse criteria among the various rankings and their own diversity, which is clearly illustrated in Figure 1. In any case, European Open Universities do not appear in the top 300 of any world ranking. A finding which may be easily explained taking into account the profile of open universities, as outlined earlier, and the major dimensions covered per ranking (table 2).

3.1. The case of the Open University of Greece and Cyprus

In the next table, Table 4, we present a brief outline of the profile of the two Open Universities of Greece and Cyprus[16].

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[16] The choice of universities has to do with the better understanding of the relevant context.

Table 4: The profile of Open Universities in Greece and Cyprus[17]

	Hellenic Open University	Open University of Cyprus
Foundation year	1992	2002
Schools	Humanities Applied Arts and Sustainable Design Science and Technology Social Sciences	Humanities & Social Sciences Natural & Applied Sciences Economics & Management
Programmes of Studies	9 undergraduate 55 postgraduate	4 undergraduate 28 postgraduate
Research – Laboratories	Humanities: 3 Applied Arts and Sustainable Design: 2 Science and Technology: 4 Social Sciences: 3	6
Members of Faculty	48 (2022)	28 (2022)
Undergraduate students	19344	1277
Postgraduate students	23552	1642
PhD students	108	66

Table 4 may explain, to a certain extent, the place of Open Universities in the international rankings. The two young, given the year of their foundation, universities maintain a small number of PhD candidates and research laboratories, commensurate with the small number of permanent Members of Faculty they employ -48 and 28 for several thousand students. They emphasize (distance) teaching, mainly targeting students aged 25 and above (ETER data, 2018) and, finally, the disciplines they treat focus on humanities and social sciences, applied sciences and technology -emphasizing the needs of the labor market. Clearly, these rough characteristics of the profiles of the two universities are not in line with the criteria set by the global rankings. This explains the positions they occupy in these rankings.

4. Discussion

Are the European Open Universities not good universities after all?

This version of excellence presupposes the view of institutions as individual units competing with each other in order to achieve superiority (excellence). In all other cases, although it focuses on the individual institution, it does not, by definition, marginalize the view of all the institutions in a country as a single system. The logic of rankings, i.e., of excellence, therefore, in fact pushes institutions, as individual structures, into competition with each other, with the prize being the individualized distinction, which is not interested in and, in any case, neglects the importance of ensuring the quality of a system and therefore the efforts to define and improve quality at the systemic level (e.g., of a country's higher education institutions). This is a different vision, which seems to have its roots in the *American way* and destabilizes the European traditions of nation states which are built on the idea of (national) understood as a system. This does not mean, on the other hand, that there were (and still are) no institutions

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[17] Data on the number of students have been selected from the ETER database and refer to the year 2018 (https://www.eter-project.com/, accessed in 05.10.2022). Other data on the universities have been found on the universities' websites.

of different levels, prestige and reputation in the nation states, or that higher education does not also reflect the social inequalities inherent in their context. The shift represented by the debate on classifications lies in the individualization of institutions and the creation of conditions of intense competition between them, shifting the focus from the system to the structure (Charlot, 2016; Stamelos, et al., 2015).

Focusing on measurement indicators, as was evident from the previous discussion, it is important to investigate: a) what is claimed to be measured versus what is actually measured, b) how the results are measured and what they mean (Rauhvargers, 2013, 2011).

Of course, on the other hand, it is becoming increasingly important for an institution to be transparent and accessible to its users, and to plan, with its own internal mechanisms, how it may continuously improve. In addition, and primarily for the sake of protection, it would be advisable for an institution to plan to improve its position in selected classifications, pushing it to reformulate beyond its initial efforts.

In any case, higher education institutions are well advised to realise that, regardless of their will, rankings will continue to exist and influence them both in relation to policy decisions by the authorities and in relation to the reactions of users and the general public. Of course, it would be risky for an institution to shift its focus from improving its quality to improving its position in the rankings. The latter could lead to critical decisions that would deviate from quality assurance standards.

At this point we must also reflect on Open Universities. Their aim and basic orientation are, among other things, to increase the opportunities for working adults or people living in hard-to-reach areas to study and improve their knowledge and skills in the knowledge society. In other words, their focus is on two central pillars of higher education - the provision of teaching and the social dimension of their mission. However, this focus does not coincide with the criteria and indicators that are usually measured, in the vast majority of cases, by international rankings.

The critical question, then, for open universities, in our opinion, is the following: Should they seek excellence in rankings when these cannot capture and measure their singularities, profile and *modus operandi*? A yes or no answer cannot be judged simplistically! Neither can we suggest that open universities should try to develop strategies in order to improve some frequently used indicators.

After almost 20 years of rankings, there is little evidence that rankings have a substantial impact on quality improvement. And, there is no correlation between rising in the rankings and making a significant contribution to society or the public good. Rankings are an inevitable manifestation of globalisation and the commercialisation of higher education. They have gained popularity because they (seem to) measure (i) the global standing of an institution, (ii) provide accountability and (iii) measure national competitiveness. However, this can potentially lead governments and HEIs to adopt simplistic solutions and distort their priorities in order to improve their position in the rankings. The history of rankings shows that measuring the wrong things can cause distortions.

Hopefully, Europe's Open Universities will not fall into this trap!

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6. ANNEX: Open Universities in Europe - Members of EADTU in the category: non-profit Open & Distance teaching Universities[18]

Anadolu University - Turkey

Eskisehir Academy of Economic and Commercial Sciences, established in 1958, laid the foundation of Anadolu University. The Academy was replaced by Anadolu University in 1982, which has since gained a well-deserved place as a modern, dynamic and innovative institution among the largest universities not only in Turkey, but also in the world. Anadolu University delivers open education under the roof of three faculties: Open Education Faculty, Faculty of Business Administration, and Faculty of Economics. Anadolu University offers 19 undergraduate degree programs, 41 associate degree programs, 107 e-certificate programs, and 60 MOOCs (AKADEMA). Open education at Anadolu goes beyond national borders, offering degree and non-degree programs to Turkish citizens across the world, including those in the Turkish Republic of Northern Cyprus, Western Europe, Balkans, Azerbaijan, and North America.

FernUniversität in Hagen (FernUni) - Germany

FernUniversität in Hagen is the only state-maintained distance teaching university (single mode) in Germany with 13 regional centres and 19 study centres. With its tradition of supported distance learning, the FernUniversität has been offering an alternative to on-campus studies within the German university landscape for 40 years and is currently serving around 78.000 students. It offers a great variety of study programmes leading to Bachelor and Master degrees as well as further education programmes. The FernUniversität also encourages and supports focus- and profile-oriented research. Years of experience in developing mature teaching materials has made the FernUniversität one of the national and international leaders in developing multimedia teaching materials and online courses.

Hellenic Open University (HOU) - Greece

The HOU, established in 1992, is the sole Greek State University that provides distance education in both undergraduate and postgraduate levels. The promotion of scientific research as well as the development of the relevant technology and methodology in the area of distance learning fall within the scope of the HOU's objectives. Meanwhile, the HOU consists of 4 Schools: Sciences & Technology, Humanities, Social Sciences and the School of Applied Arts and Sustainable Design. It currently offers 8 B.Sc. and 51 M.Sc. programmes and today the number of enrolled students exceeds 47.000.

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[18] https://eadtu.eu/index.php/members, access in 06.10.2022

International Telematic University (UNINETTUNO) - Italy

Founded in 2005, the International Telematic University UNINETTUNO emerged from the NETTUNO Consortium, a non-profit association of 43 Italian and international public universities, promoted by the Italian Ministry of Education, University and Research. UNINETTUNO delivers academic titles acknowledged in Europe and some Arabic countries. It offers undergraduate courses of six Subjects: International Law, Economics, Engineering, Media and Communication, Literature, Psychology in five different languages – Arabic, French, English, Italian and Spanish. Currently the educational offer (to students from more than 100 countries) contains, 9 Degree Courses, several Master Programs and Vocational Courses. UNINETTUNO cooperates with Universities, Governments and Institutions worldwide for the Developing of open, accessible and sustainable Education.

Open Universiteit - Netherlands

Open Universiteit, founded in 1984, is an independent, government-funded Dutch university, known for its state-of-the-art teaching methods. Within the various scientific areas, the university conducts societally relevant, impactful research, often in collaboration with businesses and other institutions. Students follow activating distance education, created in accordance with the latest insights, and supported by the newest available technologies. Students can select bachelor and master programs or courses from seven different disciplines. Characteristics of education at the Open Universiteit are openness, flexibility and quality. The university aims to provide cost-effective education and encourages innovation in Dutch higher education, in terms of both curriculum and teaching.

Open University of Cyprus (OUC) - Cyprus

The Open University of Cyprus (OUC) was founded in 2002 as the second public University in Cyprus and the only University devoted entirely to open and distance education in the country. OUC offers affordable, multidisciplinary, career-oriented, high quality and national and foreign agency accredited bachelors, masters and PhD programmes in various scientific fields, in classical and cutting-edge subject areas, which meet the needs of the business world, and upskill graduates to fulfil their personal and professional aspirations. All academic programmes are organized in three faculties: Faculty of Humanities and Social Sciences, Faculty of Pure and Applied Sciences and Faculty of Economic Sciences and Management. At OUC, there is no "one size fits all" approach. The distance teaching educational methodology and the innovative eLearning Platform utilized by the OUC enables its students to follow a broad intellectual path, irrespective of their age, time, location or life circumstances, and expand their horizons, while upholding high academic standards. The OUC's vision is to become a prestigious university of regional distinction and scale, i.e., the Edupreneurial University, which the 21st century requires.

Open University - UK

The Open University was founded as a distance teaching university in 1969 and today the OU is the largest academic institution in the UK with around 200.000 students. Built on the belief that technology could make high quality degree-level learning accessible and affordable to people who did not choose, or perhaps did not have the opportunity, to attend traditional campus universities, The Open University is "open to people, places, methods and ideas" and promotes educational opportunity and social justice by providing high-quality university education to all who wish to realize their ambitions and fulfil their potential. The OU has (approximately): 6.400 tutors; 1.100 full-time academic staff, and more than 3.500 support and administrative staff.

UNED The National Distance Education University - Spain

UNED, the biggest campus in Europe, is a public university without cut-off marks whose mission is to universalize quality higher education and ensure equality of opportunities. Technological and innovative, it fulfills its public service vocation generating knowledge and leading prestigious studies in benefit of society. UNED offers a leading online and blended learning model in Spain which centralizes online teaching in the 11 Faculties and Schools located in Madrid and at the same time offers support and classroom learning in its extensive network of more than 60 national centers and 20 abroad. Thus, UNED students can study from anywhere in the world in a flexible and personalized way.

UniDistance Suisse - Switzerland

UniDistance Suisse is a university institute accredited according to Swiss law. It offers bachelor and master distance programmes. UniDistance Suisse has been offering distance learning university programmes since 1992. Today, it has more than 2,300 German-speaking, French-speaking and English-speaking students, who pursue their education in parallel with their professional, sporting or family life thanks to the flexibility of distance learning.

Universidade Aberta (UAb) - Portugal

Established in 1988, Universidade Aberta (UAb) is the only public higher education institution of distance learning in Portugal. Due to its purpose, UAb uses extensively the most advanced technologies and methods of Distance Learning, saving no geographical borders or physical barriers, and giving special emphasis to the expansion of Portuguese language and culture within the Lusophony space (migrant communities and Portuguese speaking countries). In this context, UAb offers higher education anywhere in the world (Undergraduate, Master and Doctorate degrees) and Lifelong Learning study programs. In 2008 UAb became a reference European institution in the area of advanced e-learning and online learning through the recognition of its Virtual Pedagogical Model, which was developed around four cornerstones: student-centered learning, flexibility, interaction and digital inclusion.

Universitat Oberta de Catalunya (UOC) - Spain

The Universitat Oberta de Catalunya (UOC) was founded in 1995 as the world's first online university with the mission of using technology to make quality university education available to everyone. It has a unique, fully online and student-focused model for lifelong learning. UOC has been promoting talent, and generating and connecting knowledge for over 25 years. It is a global university with social impact, actively involved in meeting the challenges of the 2030 Agenda. UOC has around 80,000 students from 142 countries, and some 90,000 graduates have received their education in its virtual classrooms. UOC offers 27 bachelor's degrees, 53 university master's degrees, 77 UOC-certified master's degree and postgraduate diplomas, 200 specialization and postgraduate courses, 10 vocational training programmes, and 578 other courses. UOC's research focuses on the interaction between technology and the human and social sciences. It has a learning innovation centre – the eLearn Center (eLC) – and two research centres – the Internet Interdisciplinary Institute (IN3) and the eHealth Center (eHC).

University of Jyväskylä - Finland

The University of Jyväskylä (JYU) is a dynamic multidisciplinary research university. The University was established in 1863 when the first Finnish-language teacher training seminar started in Jyväskylä. Nowadays, JYU is an open and collaborative community of almost 2,600 experts and 14,000 students, including six faculties, five independent institutes and two subsidiaries. In Finland, JYU has been a forerunner in Open Access publishing. Of all universities in the world, the University of Jyväskylä is among the top three percent and represents the best of the world in several of its disciplines. The Open University of the University of Jyväskylä (JYUOpen) is the largest open university unit in Finland, serving 27 000 students annually. JYU Open is an integral part of the University of Jyväskylä. We promote educational equality and lifelong learning. At the Open University, we are actively developing pedagogic solutions suitable for adults who study while they work. The potential of online learning is used and tested boldly, yet so that study-related activities would be clear and student-friendly.

Students' perceptions on the quality in Open & Distance Education: a case study of a postgraduate programme at the Hellenic Open University

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Abstract

Designing, developing, and implementing a new postgraduate programme in an open university is a challenge, especially when quality enhancement issues are concerned. There are different perceptions of the notion of quality in higher education depending on the various stakeholders' view (Harvey & Green, 1993). Perhaps the most interesting is students' opinion because their academic work is constantly evaluated while at the same time, they assess different dimensions within the university educational context. This dual interchange of roles empowers them to reflect, act responsibly, take initiatives, learn, and shape their own learning experiences. Students' commitment towards assessment processes will ensure the quality of their studies (Ehlers, 2004). Usually, students experience different types of teaching and learning environments, so they are the appropriate informants about their support, empowerment, and quality in their learning experience (Ramsen, 1991). Nowadays, the need for high engagement in quality culture is increasing while students participate in democratic processes that enhance their citizenship skills (Beerkens, 2015) and advance the openness and sustainability that should characterize distance learning universities.

The main aim of this paper is to explore the views and opinions of postgraduate students regarding the quality of their learning experience at the Hellenic Open University (HOU). This is the case of a new 2-year postgraduate programme, entitled "Education and Technologies in Distance Learning and Learning Systems - Education Sciences" (ETA), within the School of Humanities of the HOU, that will celebrate the graduation of its first students late this summer. In this work, perceptions of students are recorded, and an overall evaluation of the attended programme is conducted. These perspectives of the first students who complete the postgraduate ETA programme at HOU in terms of the quality of their learning experience and in fact not at the level of a Module, but at the level of the Postgraduate Program, offer substantial added value to the present research.

A questionnaire is formed based on EADTU benchmarks and performance indicators (Kear et al., 2016) as well as on previous research (Ioakimidou, 2018). It is comprised of thematic areas such as motivation and expectations, workload, study skills, guidance, educational material, communication with tutors, assessment, library sources, administrative support, and overall experience in distance education. The questionnaire was distributed online to every student in the last module of the postgraduate programme during the spring semester of academic

year 2021-2022. Data were analyzed using descriptive and inferential statistics features provided by SPSS v22 software tool (Zacharis, 2016).

Results demonstrate the degree of satisfaction and acceptance among graduates and highlight study facets that are promising and fertile for future development, thus attesting to quality enhancement and sustainability that HOU firmly demonstrates the last years, establishing its leading role among European distance learning tertiary foundations.

Keywords: quality, postgraduate, student perceptions, curriculum design, support, evaluation

1. Introduction

Designing, developing, and implementing a new postgraduate programme in an open university is a challenge, especially when quality enhancement issues are concerned. There are different perceptions on the notion of quality in higher education depending on the various stakeholders' view (Harvey & Green, 1993). Perhaps the most interesting is students' opinion because their academic work is constantly evaluated while at the same time, they assess in formal or informal ways various dimensions within the university educational context. This dual interchange of roles empowers them to reflect, act responsibly, take initiatives, learn, and shape their own learning experiences.

The main aim of this paper is to explore the views and opinions of postgraduate students regarding the quality of their learning experience at the Hellenic Open University (HOU). This is the case of a new 2-year postgraduate programme, entitled "Education and Technologies in Distance Education Teaching and Learning Systems – Education Sciences" (ETA), within the School of Humanities of the HOU, that will celebrate the graduation of its first students this autumn. In this work, perceptions of students are recorded, and an overall evaluation of the attended programme is conducted. These perspectives of the first students who complete the postgraduate ETA programme at HOU in terms of the quality of their learning experience and in fact not at the level of a module, but at the level of the Postgraduate Programme present a clear gain and benefit for the current research.

2. Students' experience in tertiary distance education

In the era of massification in education an approach of quality as added value to the learning experience of students seems extremely important (Harvey, 2002). Rowley (1996) depicts two approaches to the assessment of students' learning experience that coexist:

- methods that focus on the evaluation of teaching and learning and are linked to quality assurance (measurements based on indicators and specific benchmarks),

- methods that assess the overall learning experience of students and are linked to quality enhancement (student satisfaction and the satisfaction of all those involved in the educational process).

O'Maley & McCraw (1999) roughly describe a model based on three factors that form the perceived effectiveness of distance education:

- students' previous educational experience,
- each student's learning profile,
- the perceived characteristics of distance education.

Thomas (2002) researching on factors that influence students' studies underlines six broader thematic areas rather than factors:

- Academic readiness, whether students are ready to cope with the demands of higher education, but also support that is provided to face such difficulties,
- Academic experience, related to the content of the studies, teaching, and learning issues, accessibility and relationships between students and teachers, flexibility (timetables and due dates for assignments), assessment and opportunities to repeat courses,
- Expectations of the institution and its commitment to supporting students,
- Students' financial obligations to the university and their employment obligations,
- Support from family and the wider community,
- The institution's support to the students.

Elhers (2004) studies students' preferences in distance education and he develops thirty indicators on seven axes:

- Teachers' support
- Collaboration
- Technology
- Cost-expectations-benefits
- Information and transparency as it concerns the institution
- Learning structure
- Didactics

Lionarakis (2006) supports that the basic pillars in a model for distance education are:

- the student
- the teacher
- learning
- teaching
- communication
- the educational material
- time
- place
- the educational institution
- assessment

On the go more models came up, like Smith (2008) who suggests a model based on various stakeholders' views on the learning experience in distance education institution with 4 quadrants: reflection, students' learning, assessment, and learning experience. Research puts in the center the learner who evaluates the teachers, the courses provided, the educational material, his/her overall experience in both conventional and open universities (Burns, 2011; Thapliyal, 2014).

In the framework of the E-xcellence project, the European Association of Distance Teaching Universities (Kear et al., 2016) published the third edition of a set of axes and indicators for

distance education programmes entitled "Quality Assessment for E-learning: a Benchmarking Approach" highlighting:

- Strategic management,
- Curriculum design,
- Course design,
- Course delivery,
- Staff support and
- Student support

The learning experience of students in an open university is related to how they perceive the way they interact with the educational institution they are attending. This more generally may relate to their academic and personal development, their social networking and interaction, as well as support services offered to them. These conditions do not have the same importance and significance for everyone, and they are certainly related to other factors. The learning experience of students is obviously influenced, sometimes decisively, by the trends and current orientations as it concerns learning and teaching.

So, the model "one size fits all" is abandoned and the focus is on the learning design, the learning environment, people and processes that support the expected learning results and evaluate the overall students' experience (Laurillard, 2002; Pond, 2002; Rowley, 2003). Even more recent studies focus on the perspective of students and highlight important factors, which play a decisive role in shaping a quality experience for them: the learning climate and social interactions, feedback at individual and group level (Keržič et al., 2019). In any case, commitment to assessing and continuously enhancing teaching and learning in a systemic approach will assure the best possible learning experience for students.

3. The engagement of students in effective feedback mechanisms
Students' commitment towards assessment processes will ensure the quality of their studies (Ehlers, 2004). Besides, what is offered in universities should "meet students' expectations of equity, access, participation, collaboration engagement, passion and motivation" (Ossiannilson, 2020, p. 29). Usually, students experience different types of teaching and learning environments, so they are the appropriate informants about their support, empowerment, and quality in their studies (Ramsen, 1991). Continuous quality enhancement processes require feedback from all involved, let alone the students in a university (Harvey, 2002). Students are the most involved stakeholders in the educational process. Participating in quality processes and mechanisms aimed at enhancing the operation of an educational institution students develop skills like critical thinking, reflection, and responsibility (Lizzio & Wilson, 2009). This participation of students in a broader learning community should be an aim for every educational institution (Little, Locke, Scesa, & Williams, 2009; Little, & Williams, 2010).

Their involvement can also be seen in the context of institution's democratic, participatory operation that also aims to cultivate efficient and active citizens (Lizzio & Wilson, 2009). At the same time, the need for high engagement in quality culture is increasing while students

participate in democratic processes that enhance their citizenship skills (Beerkens, 2015) and advance the openness and sustainability that should characterize distance learning universities. The choice of involving students in processes of shaping a desired culture and corresponding practices in an educational institution is part of a new political mentality and trend with strong citizen participation adopted and promoted by various governments (Beerkens, 2015; Little et al., 2009).

An important parameter of successful involvement of students in a feedback process is the moment of their intervention, the time of expressing the students' point of view, for example during, at the end of their studies (Tai, & Lin, 2012) or even two or three years after the completion of their studies. In this case though there is the risk of embellishing some aspects or inability to remember some important facts. Two other important factors are the appropriate research tools used, the way questions are phrased and how understandable are the students' statement and ideas (Henard, & Roseveare, 2012). Gradually the students will get used to the rational and the practices used to evaluate educational processes.

Universities aim to reach high degree of student satisfaction with their studies. Harvey (2001) suggests that research on the degree of students' satisfaction offers three advantages:

- the student's view, who's the main stakeholder of the educational process,
- a view given in a simple clear way without complicated verbal expressions,
- rich data in a variety of issues that influence future students

As Rowley (1996: 239) puts quality is defined by what's left from customer's perception, in our case students' perception, of what quality is after their expectations are covered. The degree of students' satisfaction is related to students' dropout rates (DeShields et al., 2005). Especially in cases that quality is seen as value for money (Harvey, & Green, 1993), for example in programmes that students pay fees, the degree of their satisfaction is very important factor (DeShields et al., 2005).

There are voices though that react to this tendency described above to engage students in quality and assessment procedures (Rowley, 1996; Tai, & Lin, 2012). The main argument is that students don't know how universities work, so they ask for non-realistic changes. Others raise objections on issues of reliability and honesty of some tools and finally there are also concerns expressed about extreme cases of blackmailing students to get better grades (Henard, & Roseveare, 2012).

Engagement and satisfaction means being informed and moved. There should be an introductory course to familiarize students with the institution's demands, processes and tools used like platforms and online tools to empower them handle distance education studies and encourage them to engage themselves actively (Keržič et al., 2019) and this seems to be imperative for students coming from traditional to open universities. This position is reinforced by more recent research during the pandemic that suggests that first-year students with no prior experience in distance education appeared less engaged in the educational process than more advanced students (Stevanovic et al., 2021). Some even suggest that online learning during the pandemic was easier for older postgraduate students (Tang et al., 2021), so more experienced university procedures and more dedicated to their studies students.

4. Research Methodology

4.1 Context of the Study

This study took place at the HOU, the only university in Greece using exclusively distance education at graduate but also postgraduate level. A new postgraduate programme entitled "Education and Technologies in Distance Education Teaching and Learning Systems – Education Sciences" (ETA), within the School of Humanities of the HOU, started two years ago with the first students graduating a few months ago. This programme is consisted of eight six-month modules. Data were gathered from students that had just finished the last module ETA63 "Design, development, and management of distance education programmes", in the period June-July 2022. The target choice of the survey was supported by the theoretical background, developed in the previous sections and especially by the presumed significance of the newly introduced ETA programme.

4.2 The questionnaire

A questionnaire is formed based on EADTU benchmarks and performance indicators (Kear et al, 2016) as well as on previous research (Ioakimidou, 2018). It is comprised of thematic areas such as motivation and expectations, workload, study skills, guidance, educational material, communication with tutors, assessment, library sources, administrative support, and overall experience in distance education (available in Greek language at https://docs.google.com/forms/d/e/1FAIpQLSfs_6JN063Ew5IAt1DBYZpDVlZJh7niA4ywcEUThRAbrjGo0Q/viewform).

Reliability, in general, involves the degree the research design can lead to consistent findings, e.g. doing the "things right", follow procedures, avoid observer of subject biases (Easterby-Smith et al., 2012). A similar notion is that of validity, which refers to the internal consistency of findings, e.g. doing the "right things", look at the right place the right time, define the direction of causality.

To accurately measure reliability and validity of the questionnaire, the Cronbach A criterion was used (Table 1). Indeed the degree of reliability was high enough, which indicates great internal consistency of variables in the scale.

Table 1: Reliability Statistics

Cronbach's Alpha	N of Items
,910	20

4.3 Data collection and analysis

The questionnaire was distributed online to every student in the last module of the postgraduate programme during the spring 2022 (total = 195 students). The tutors sent the

link to their students, and they voluntarily completed the questionnaire within a period of three weeks it was available, so convenience sampling was chosen as the sampling method. To accurately analyze quantitative data, the standard scientific software tool, especially designed for statistical processing, SPSS version 22, was used (Field, 2013). This software package is appropriate for closed type questions, while information retrieval techniques were used to process the open-type ones.

4.4 Descriptive Analysis

In total, 45 questionnaires were fully completed with 30 questions each. From the demographics section, it is asserted that 73% were female students and 27% male ones. Among them, 68% hold a degree in humanitarian studies (literature, pedagogy, etc.) while 32% have graduated from informatics and technology departments. For 80% this was their first graduate degree, while 20% already possesses another one. In the selection of this specific programme using distance learning, the most important reasons were career empowerment (56%) and personal development (33%).

Section 1: The educational material

Analyzing educational material (question #1), most students (90%) find it adequate, modern, containing valid scientific sources and covering a broad spectrum of views, organized and interesting.

In addition, the majority (85%) suggests that educational material was very supportive regarding pedagogical characteristics of distance learning (specific learning outcomes, functional modularity and structure, evaluation, and self-evaluation activities, cultivating post-cognitive skills). It was also tailored to fit the learning context and fully integrate within the asynchronous platform (question #2).

About 62% of students (question #3) report that the material was esthetical superior, can provoke interests and curiosity, with short texts, understandable language, approachable and friendly style. About 1/3 of students are not satisfied with the material.

The platform providing and supporting the material was also very friendly and easy to work with. Indeed, the material was designed for learners in order to work autonomously in self-study mode. The majority of students (78%) also report that distance learning material was easy to handle and work with, while 22% disagree with that view (question #4)).

Interpreting collectively the answers of section 1, the pro's of the material include 'polymorphic', interesting, innovative, understandable, modern, supportive, appropriate to students' needs and to postgraduate degree demands. It is provided in multiple, flexible formats and meets the accessibility needs of individual students. The con's refer mostly to the huge volume of the work, the extensive bibliography and external links to sources that require a lot of time to process, the strict programme of 14 weeks' study period in a rigid pace.

Section 2: The tutors

In section 2 questions (tutor-counsellor), 83% of participants say that teachers presented and analyzed basic scientific notions fully and adequately (question #5).

A large 90% answer to question #7 that teachers exploited teamwork collaborative techniques with Groups Counselling Meetings. The expected frequency of student-tutor interaction during the programme was indeed high.

Around the same percentage declare that teachers encourage and motivate students to progress in their studies (question #8). The teachers have actually created a culture of supportive critique and scientific review.

The same high scores get the answer to the question denoting satisfaction in communication with the teachers of the programme (question #9). Both synchronous (e.g. telephone) and asynchronous (e.g. email) communication modes among tutor and students are observed with high rates.

Aggregating pro's in teacher practices, students report that the tutors where friendly and reachable, with positive attitudes and held interesting meetings. In con's, included misunderstandings, authoritative style, and weak engagement to programme, in same particular cases.

Section 3: Evaluation

About 75% regards that assessment methods of learning outcomes (written project, evaluation activities, final exams) broadened the learning opportunities of the students (question #11).

The majority (90%) mentions that they received satisfactory feedback to the evaluation of the written project they elaborated within the module (question #12). This includes constructive tutor comments and suggestions, error correction and reviews.

About 65% consider the evaluation system of ETA modules (as organized by the Unit of Internal Evaluation of the University) was very effective while 27% report it's not so effective (question #13). The evaluation process is highly interactive and provides valuable feedback to the improvement of the learning capacity of students.

Section 4: Student support

Negative answers (53%) collected in response to the question to what extend did the students utilize the University Library (lib.eap.gr) during their studies (question #14). Although the Library contains a huge amount of valuable accessible resources, students do not take advantage of that. This is indeed a sector that needs to be looked at.

Positive answers (55%) gathered to the question #15 of how effectively they were supported by the University administrative services during their studies (registration, payments, information about timetables and instructions).

The majority (78%) in question #16 find the software platform LMS (Learning Management System) that HOU uses for deploying asynchronous learning courses particularly easy-to-use and friendly. This platform (www.courses.eap.gr) is developed on Moodle free, open-source system, which is a very popular LMS worldwide today.

The usability of the synchronous platform used for online meeting and exams, was also evident for 95% of students (question #17). Clearly the platform conforms to usability and accessibility standards, satisfying its users.

A large percentage of 70% in question #18 is satisfied with technical support received by university helpdesk. Provision of technical support is managed by the efficient University IT Department (https://noc.epa.gr).

Section 5: The curriculum

A percentage of 63% considers the range of issues posed on thematic modules were broad and complete, while 31% are not satisfied. Curriculum design seems to address the needs of target audience (question #18).

Clearly stated learning outcomes are an important factor of the study programme, especially in distance education. Sufficient assessment of these leads normally to successful programme completion. 71% say that expected learning outcomes were completely achieved (question #20).

The most interesting module was ETA62 (Digital Media in Education and Communication) with 42%, following ETA53 (Teachers and Learners in distance education environments) with 16% and ETA63 (Design, development, and management of distance education programmes) with 13% (Figure 1). ETA62 focuses on issues like digital literacy, digital media in distance education and online learning environments.

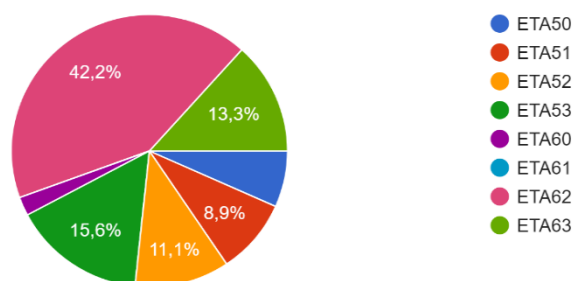21. Which, in your opinion, was the most interesting Thematic Unit?

Figure 1: analysis of question #21

The most time-consuming module was ETA61 (Research methods, design and writing of scientific work) for 40% (Figure 2). This unit, offered on 3rd semester, aims at the basic principles of qualitative and quantitative research and describes the main steps of research design.

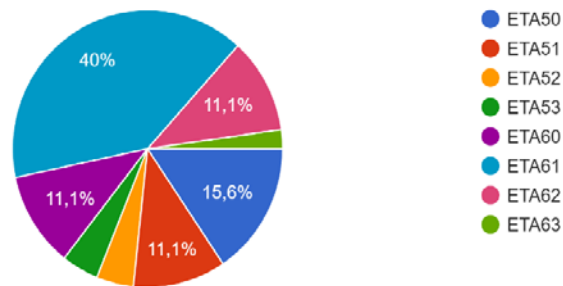22. In which Subject Unit did you have to spend more study time?

Figure 2: analysis of question #22

The same module was the most difficult one for 56% of students (question #23). This seems to be an expected answer for a module that copes with core methodological research issues.

<u>Section 6: Overall evaluation</u>

The overall evaluation of the programme is considered positive. Around 70% of students declare that it met their expectations, while 56% assess the programme as very good/excellent, that is between 8-10 in Likert scale (Figures 3, 4).

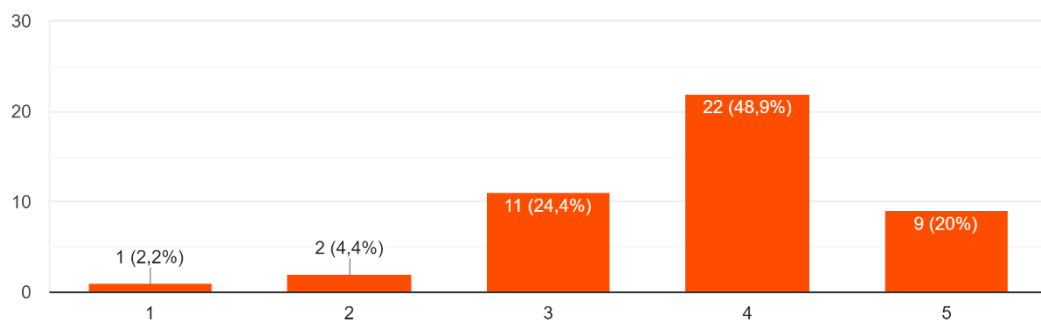24. To what extent did the program meet your expectations?

Figure 3: analysis of question #24

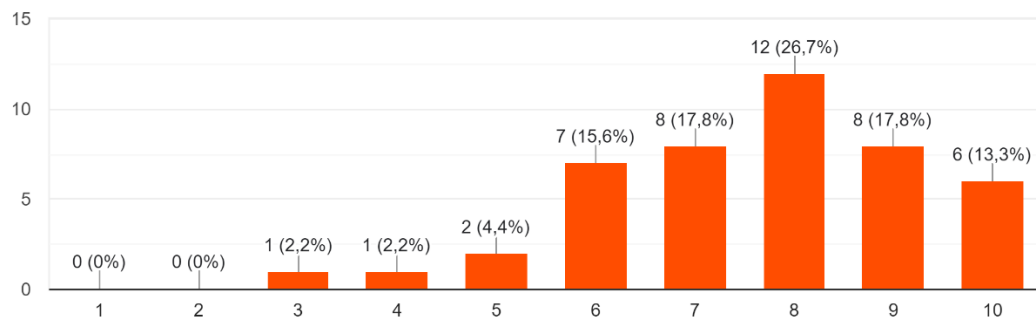25. How would you rate ETA as an overall study experience?

Figure 4: analysis of question #24

General assessment involves mostly positive remarks, regarding flexibility in studying, useful and quality material, interaction, and collaborations, modern distance education pedagogic approaches, independence, and self-paced and self-regulating learning. The evaluation process is highly interactive, the feedback is reconstructive and the assessment activities gauge the individual student's learning progress. Negative comments focus mostly on specific cases of miscommunication, vast content in libraries and repositories, time-pressure and strict scheduling, induced study and exam period anxiety.

5. Discussion

In this article, the participation of students in evaluative processes is considered an added value, both for themselves as they can reflect on what they have experienced and what they are experiencing, to shape conditions in the educational institution where they are studying, thus contributing to the enhancement of the functioning of the university at various levels and the learning experience of future students.

According to the students' answers, it seems that the educational material in ETA programme is of high quality. As ETA a new programme the material is designed and developed by a team of experts in distance education with long engagement on the field using books and articles written by well-known researchers like Toby Bates, but also guides and original material created especially for the ETA's needs. The team of experts in distance education assured that the educational material has the appropriate pedagogical characteristics for this form of learning making clear its objectives, the desirable learning outcomes, key words, clear structure, self-assessment activities, summaries, sources for further optional study, references. All these characteristics are appropriately connected to make meaning and to maximize students' independent learning process (Kear et al., 2016). For most of the students this is an attractive, interesting, understandable, easy to handle material. Students that find the content of educational material interesting, and relevant to engage themselves to study harder (Harris, Larrier, & Castano-Bishop, 2011). On the other hand, there is a heavy workload, lots of additional optional literature that creates some anxiety to have at least a vague idea what's about, along with external links time consuming.

It seems that teachers support students focusing on their communication being friendly and available, but also their interaction in the context of teleconferences (Team Advisory Meetings as they are called in the HOU). Teachers in teleconferences offer some guidance on the basic scientific concepts related to the students' education material and at the same time offer opportunities to students to interact using teamwork in breakout sessions. Student-teacher, and student-students interaction can reduce feelings of isolation (Harris, Larrier, & Castano-Bishop, 2011) and at the same time to multiply learning opportunities. Student support from the tutor seems to be continued in person through e-mails, phone calls and discussions in fora. Frequent student-teacher interaction and communication in every possible way is a crucial factor for student support (Harris, Larrier, & Castano-Bishop, 2011). Very few exceptions were mentioned with teachers having authoritative style, and weak engagement to programme. It's not by chance though that these teachers teach at the same time in traditional universities having difficulties to understand what students' needs are in distance education. The role of the teacher is crucial in shaping student's experience (Harris, Larrier, & Castano-Bishop, 2011) and in students' satisfaction as well as in reducing dropout rates (Williams, Kear, & Rosewell, 2016).

In the ETA programme students understand the intended use of assessment as an opportunity to learn and develop themselves as well as to enhance their learning experience. Moreover, they identify the value of effective feedback, and they recognize the importance of having the opportunity to express their opinion in official assessment procedures where they are called to evaluate a variety of dimensions in the module, they finish each time. In part students' understanding may be the result of their participation in ETA63, a module on issues of quality and assessment. There are opportunities for formative and summative assessment and that's crucial (Kear et al., 2016), while initial assessment is used by tutors mainly in fora and teleconferences.

Only the minority of students used library support even though the library in the HOU is online available all day long as it should be (Kear et al., 2016) and despite the huge number of institutional and collaborative repositories and open educational resources (OERs) it contains. This result is understandable probably because the students participating in this review chose to attend eight modules instead of writing a dissertation. Administrative and technical support was satisfying, as well as all the platforms used for synchronous, asynchronous study and exams, another important factor that affects students' experience (Harris, Larrier, & Castano-Bishop, 2011). After all, experienced students answered the questionnaire.

Most students think that the content of the modules covers a range of issues on distance education structured on a meaningful way and that the expected learning outcomes, as they were expressed at the beginning of each module, were achieved which is very important (Elhers, 2004; Harris, Larrier, & Castano-Bishop, 2011; Kear et al., 2016). The most popular module seems to be ETA62: Digital Media in Education and in Communication, probably because of its practical character and applicable content. This agrees with other research's results too (Harris, Larrier, & Castano-Bishop, 2011). The second preferable module is ETA53: Teachers and Learners in Open and Distance Learning environments, maybe because its pedagogical character is familiar to ETA's students as most of them were teachers in schools, and ETA63: Design, development, and management of distance education programmes, their

last module. The most difficult and the more time-consuming module was ETA61: Research methods, design, and writing of scientific work. Research methodology is a difficult issue for Greek students as they are not often getting familiar with research during their undergraduate studies.

The overall students' experience in the ETA programme is positive and the programme seemed to fulfill their expectations, an important quality indicator (Thomas, 2002; Smith, 2008). This is very important as the degree of students' satisfaction affects their dedication and their efforts to finish the programme (Harris, Larrier, & Castano-Bishop, 2011). Qualities mentioned may be summarized in flexibility in time and space of studying, independence to manage studying, self-paced and self-regulating learning which are not that rare finding (Chesnut, Ruddy, Simmons-Thatcher, & Sinders, 2021). Negative comments focus on specific cases of miscommunication, vast content in libraries and repositories (though this was optional study), time-pressure (a factor often reported by adult students with increased professional and family commitments) (Harris, Larrier, & Castano-Bishop, 2011), workload, and exam period anxiety.

This study has limitations. First, the relatively small number of participants and the lack of sufficiently large qualitative data, so generalizability at large scale can be challenged, especially when referring to small groups within a designated context. Another limitation resides in the methodological design of this research, as one of the main variables was students' perceptions, a parameter that could be probably better examined using qualitative tools (e.g. semi-structured interviews). This paper emphasises on a questionnaire combining open and closed type questions, in order to record students' views. In research literature, though, there is a variety of tools like interviews, tutorials, focus groups with students or students' unions, that could be also applied. Moreover, it would be interesting to research other stakeholders' views on this postgraduate programme.

There is though this feeling of satisfaction as the ETA programme seems to leave a generally good impression on the students. The level of contentment is generally evident throughout their answers. This programme seems to combine in a fine balance the critical factors of student satisfaction and overall efficiency. These quality dimensions are quite important for the systematic appraisal and sustainability of this particular programme.

6. Conclusions

This paper seeks to research through students' feedback their collective learning experience in postgraduate studies at the HOU. A quality enhancement system needs every stakeholder's commitment, dedication and raising of ownership to function properly and to succeed its purposes.

Despite the steady increased popularity of the distance education programmes, the demand of quality in higher education remains an open issue. Challenges of distance education are perceived differently among students and their comprehension has influenced attitudes towards the wider acceptance and use of distance teaching and learning methods within the HOU and elsewhere. These attributes decisively define the success of open universities and the specific education model in general.

The current study assessed the perception of learners towards the quality of the new ETA Master's programme provided by the HOU. The study was divided into six different sections (educational material, tutor-student interaction, learning objectives achievement, student support, overall assessment, and demographic-general information). The perception of students was positive, on aggregate. They pointed out mostly autonomy, self-regulation, and independence of their studies. However, a few of them made complaints about specific parameters e.g., interaction with instructors, extent of learning material, demanding activities, tight schedule and exam procedures. After all, it should be reminded that all students are adults, facing a lot of pressure from their family and employment obligations.

All agents inside HOU (teachers' group, Head of postgraduate programmes, Internal Evaluation Unit) should consider these views and develop synergies accordingly to elevate the degree of overall satisfaction and acceptance among graduates, with demanding quality conformations and academic excellence orientation, to establish the leading role of HOU among European distance education tertiary foundations.

The more students are committed to their learning path and involved in processes of improving the educational institution and in social actions in the context of student life, the more chances there are to successfully complete their studies and avoid dropping out. It seems that what most students in distance education institutions need is a learning environment tailored to their individual needs and expectations, an environment that is innovative, flexible, and adaptable to new technological and scientific data, with up-to-date content, with multiple opportunities for networking, communication, interaction, and cooperation, with a voice and active participation in improvement actions of the institution.

The design of more successful courses (like ETA) in the future will be possible if all student opinions are taken into account, features of satisfaction are highlighted and points of concern are carefully examined. The flexibility and adaptability of HOU's new learning modules will then guarantee their popularity. This institutional policy will be undoubtedly proven reliable and effective, thus securing HOU's prominent position among distance education academic organizations worldwide.

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Artificial Intelligence in Teaching and Learning

Humanoid Robot Tutor in a Learning Activity: Insights From an international workshop with students from universities in Germany and Israel

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Abstract

Human-robot interaction (HRI) is starting to be recognized as a skill required in the 21st century and has been venturing into higher education as AI-enabled features become accessible through software affording to develop a motivating and engaging learning process. In light of these trends, we designed an international workshop conducted as part of the Erasmus+ exchange project dedicated to Social Robotics. There, graduate students from universities in Germany and Israel participated in four joint and on-campus meetings aimed at developing interactive educational concepts supported by humanoid robots. The workshop's purpose was to develop a learning scenario guided by a humanoid robot. Students participated in a five days workshops consisting of seven phases and practiced in groups of specialists. In the first phase, students were given a general brief about the aim and purpose of the workshop. In the second phase, the instructors created groups containing students from both institutions and assigned them to one of the following toles roles: team leader, designer, or developer. Each group selected a theme to work on the following topics: playing chess, meditation and breathing exercises, improving the cognitive capabilities of the elderly, and learning a foreign language through singing songs. In the third phase, each group brainstormed on the topic they selected. In the fourth phase, participants designed a learning scenario. In the fifth phase, participants were shuffled into three groups to discuss current and expected challenges according to their role as specialists. In the sixth phase, groups reshuffled their original settings and conducted technological development. In the last phase, groups demonstrated the technological outcomes based on their previous efforts. Students participating in this workshop shared their insights through an online survey and a written reflection. There, the students self-assessed the skills and attitudes they developed through their participation in the joint sessions and commented on the positive and negative aspects of the multiphase process of the workshop. All 12 students participated in the online survey, six from Israel and six from Germany, 50% female, and 50% male. 67% of the participants were 21-26 years old. 75% of respondents rated the learning experience in international groups with the highest value on the scale from "1 = not at all" to "5 = very much", and 25% gave a rating of 3 to 4. The online survey asked the participants to rate the skills and attitudes they learned through participation in joint sessions in international groups on a scale from "1 = I have not been learning this at all" to "5 = I have been learning this very intensely". The skills and attitudes with the highest rank were the ones in the area of creativity and innovation, life and career skills, openness towards people from other cultures, and social, emotional, and communication skills in ethnically, culturally, and linguistically diverse contexts. Finally, participants expressed that the joint workshops provided them with valuable experience of

collaborating in international teams and that the diversity of students contributed to creative and innovative solutions that emerged during joint sessions.

Keywords: please add your keywords without capitals here, separated by commas.

Machine Learning methods in classifying and searching Textbooks and other Educational Objects

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Abstract

Textbooks and Educational Objects (EO) search and retrieval to support teaching and learning is of significant importance for both professors and students. This paper aims at presenting different AI-based methods for efficiently classifying a corpus of textbooks and relevant Educational Objects, which is available through a digital library. The Table-of-contents of the books or the EO (and not the entire documents) are used to provide a sufficient description of them for the purposes of classification. This saves a lot of processing time and relieves the classification and searching processes from noise-like data included in the document's body. The proposed methods are applied on a big collection of ebooks (the Springer ebook Collection) and evaluated against well-known classification accuracy metrics, like Precision, Recall, Micro- and Macro-average F1 score. They are also applied on a smaller collection of EO (textbook chapters) written in the Greek language, the KALLIPOS collection (repository.kallipos.gr), for the purposes of highlighting multilingual issues. We have designed, tested, and evaluated an unsupervised neural network (NN) (self-organizing maps, SOM) [1] and two deep neural network (DNN) architectures, under various configuration scenarios utilizing the above-mentioned ebook collections. Extensive experiments were conducted using various configurations of preprocessing steps, NN set up and vector and vocabulary sizes as well as the use of context words to assess their impact on the classifier's performance. The proposed method relies on a relatively generic feature selection process that reduces the need for extensive feature engineering and is independent of changes to the dataset. Using this feature selection process, we can capture the most significant features of the dataset while maintaining the vector size relatively small, thus improving classification efficiency. Moreover, the well-established Latent Dirichlet Allocation (LDA) method [2] is adapted and used for classifying the above-mentioned collections (Springer and KALLIPOS). LDA, like the SOM NN presented above, is also an unsupervised approach to classification. It discovers latent topics and describes each document in the corpus as a mixture of these topics, dramatically reducing the dimensionality of the document descriptors. The innovative element of the proposed multilabel-LDA method is the use of a hierarchically structured standard dictionary and respective standard 'Theme documents' derived from it, to assign multiple labels to the latent topics and, subsequently, to each document of the corpus. Both SOM and LDA methods enable the identification of 'similar documents', that are semantically close to each other, thus are ideal candidates for search and retrieval.

1. Introduction

Institutional Repositories are used as the primary source for searching and retrieving educational material for students and professors alike. In this context, the users often provide keywords they believe to be relevant as search terms. Using those terms, the search engine provides a list of results, ranked according to the similarity of the search terms with terms in each book. However, the results are often either belonging to a different topic or vice versa, not including relevant books, if they do not contain the exact search terms. This issue intensifies as the content of an Institutional Repository increases. The Table-of-Contents (ToC) of the books or the Educational Objects (EO) (and not the entire documents) can be used as an alternative to provide a sufficient description of them to support classification and retrieval tasks. This saves a lot of processing time and relieves the classification and searching processes from noise-like data included in the document's body. This paper aims at presenting different AI-based methods for efficiently classifying a corpus of textbooks and relevant Educational Objects, which further facilitates searching information within the corpus in a semantic, rather than syntactic way.

Traditionally, the automatic categorization of a set of electronic documents into a set of categories or subjects, which are denoted by labels, is a supervised classification task [19], [28]. In this case, the classifier learns on the basis of labeled instances that are used during the training phase and, afterwards, the testing subset is used to assess its performance. However, this approach requires large, well-annotated corpora and is ineffective on datasets that have an unbalanced distribution of samples among the classes. Due to this limitation, unsupervised and deep learning approaches are typically selected over supervised ones.

In our case, the classification of textbooks and other EOs can be considered as an automatic document classification one and specifically belonging to the multiclass classification, in which each document can be assigned only to one class. This problem has convened the interest of the scientific community [1],[8],[18],[19]. The main focus of these efforts is the transformation of the problem to a set of binary classification tasks, in which for each category present in the corpus a different classifier is created and trained. The output of this task is a number of different classifiers that are able to distinguish between the different categories present in the set. However, this approach requires a practically unchanged dataset, and could not be applied in our case as both in the Springer and the KALLIPOS dataset new categories can be introduced in any time.

Furthermore, the nature of the datasets, having limited or no training and testing samples available, imposed the use of either semi- or unsupervised approaches, like the self-organizing maps (SOM) neural network (NN) and the Latent Dirichlet Allocation (LDA). SOM is an unsupervised machine learning method that can gather similar documents together using vector similarity measures without prior knowledge of the categories. In this case, the labels of the training instances will be used only to guide the assignment of labels of the testing dataset after the training phase. LDA [2], like the SOM NN, is also an unsupervised approach to classification. It discovers latent topics and describes each document in the corpus as a mixture of these topics, dramatically reducing the dimensionality of the document descriptors.

The remainder of this paper is organized as follows: In Section 2, recent approaches for multiclass document classification that use SOM, DNNs and LDA are reviewed. Section 3 describes the two datasets that are used to test the different methods, and Section 4 presents the proposed methodology in detail. Section 5 gives some

examples of the application of the proposed methods, while Section 6 presents the conclusions of this survey and provides thoughts on improvements and future work of the ongoing studies.

2. Related Work

2.1 SOM and DNN architectures for classification

SOM is an unsupervised NN that can cluster similar data together irrespective of the labels that are assigned to them [3]. SOM utilizes a novel map-based approach to display higher-dimensional vectors to a two-dimensional space [1], [4]. SOM, apart from document classification, has been utilized successfully in different application domains, such as biology, economics etc. [1] addresses the problem of managing large document collections using SOM. This study also provides some suggestions on how to achieve dimensionality reduction for large SOMs, based on the experiments conducted that may prove useful for other studies as well. One of the main outcomes of this study, is that the use of very large SOMs as a modelling approach should be avoided, as it increases the complexity and processing time. [5]proposes a SOM variant for email multiclass classification, namely the Cascaded SOM, that handles the different classes by utilizing a hierarchical approach. The authors suggest that the proposed approach can be applied to any multiclass classification problem with a small number of labeled samples. This is an interesting approach for our case, as part of this solution could be adapted in our case in order to discover relations between the different classes in terms of hierarchy (i.e., a class that is a sub-category of a more general one).

Deep Learning is a set of NNs[6], that are capable of supporting supervised, unsupervised and semi supervised scenarios [7]. In [8], a hierarchical deep learning method for text classification has been proposed in order to cope with the supervised classifiers performance degradation, an issue that intensifies when increasing the number of documents in a collection. Another contribution of [8], is the use of RNNs for capturing time-dependent structures in the text. Similarly to [5], this study also aims to classify each document in the corpus based on a hierarchical structure. The use of RNNs and CNNs for sequential short text classification has been presented in [9]. In order to evaluate the solution three multiclass datasets for dialog act prediction were utilized. Furthermore, in [10]character-level features were engaged for multiclass text classification. The solution presented in this study relies on CNNs.

Overall, our study evaluates different machine learning methods in classifying and searching textbooks and other EO. The methodology that will be presented in the following sections leverages on the advantages provided by the state-of-the-art approaches, reviewed in this section, for efficiently classifying a multiclass corpus in terms of feature engineering, training and label selection. One of the main targets of our approach is to provide insights on the modelling approach to be followed, in order to enhance the classifier's performance while maintaining a balance between the achieved accuracy and the processing time and computational resources needed. As detailed also in the Introduction, the nature of the datasets used in our case prohibited the reduction of the problem to a set of binary classification problems. Instead, we designed a generic feature selection process easily applicable to various scenarios and different datasets. Furthermore, we selected the batch SOM training pipeline providing faster convergence and we experimented with two different DNN architectures deemed effective in various document classification tasks.

2.2 LDA-based multi-label classification

The Latent Dirichlet Allocation (LDA) [2] is an unsupervised generative probabilistic method for modeling discrete data collections such as document collections. LDA assumes a three-level hierarchical Bayesian model in which each document in a collection is modelled in terms of a set of latent topics as a probability distribution or a finite mixture of them. The topics, in turn, are represented as probability distributions over the collection's

Dictionary. The topics participating in the word generation process for each document are samples of a multinomial distribution, which is derived by sampling a Dirichlet distribution assumed for the collection. Applying LDA to a specific document collection gives estimates of the assumed model parameters, including the topic probability distributions over the Dictionary words and the respective probability distributions of the documents over the discovered set of topics. One problem with this method is that the topics that are discovered by the LDA, are unlabeled and agnostic to the end user.

Various methods have been proposed towards overcoming the problem mentioned above and assigning labels to topics and documents. The work presented in [11] proposes a method for filtering the vector of the Dirichlet topic prior to the generative process of LDA, so that its values correspond to the relevant labels. In this case, the decision as to whether a hidden topic corresponds to a label is decided by a Bernoulli coin toss method. A limitation of this approach is that it requires some probabilistic data to be pre-calculated for each label, and thus it is not an automated one. Furthermore, the prior probability ϕ_k should be determined in advance, which cannot be guaranteed for a given set of documents.

LF-LDA [12], based on Labeled LDA [11], is another recent method for solving this problem. Words that do not aid in matching with a thematic section but do aid in syntax or comprehension are removed during the algorithm execution in the basic algorithm of Labeled LDA. However, while LF-LDA and Labeled LDA both have limitations—such as the inability to process documents with an unknown subject and the inadequacy of the filtering performed using a Bernoulli coin toss—the developed LDA multi-label classification solution removes superfluous words from documents during pre-processing and stemming, mitigating LF-LDA's removal of words that help with syntax and comprehension.

The LD-LDA algorithm presented in [13], aims to overcome the limitation that labels can only be associated with a fixed set of latent topics or a set of non-overlapping latent topics. This approach focuses on providing a more thorough description of topics by characterizing labels as a probability distribution of all latent topics. Although the LD-LDA model's observables, parameters, and hidden variables are tailored for the protein function prediction problem, the method can be applied to other multi-label scenarios with some modifications.

While many methods have been proposed for the LDA-based multi-label classification problem, none of them has been able to offer a fully automated, unsupervised solution to describing documents of unknown subjects as probability distributions of labels. The methodology proposed in the next section of this paper gives a possible answer to this shortcoming.

3. Dataset Description

3.1 The Springer collection

The dataset that is used in this paper has been created from a collection of 56.403 multidisciplinary book titles from Springer, to which the Hellenic Academic Libraries Link is subscribed[1]. This collection serves as a reference for tutors when suggesting sources for further reading, in addition to the basic learning material they provide to their students. For each book in the corpus a set of metadata, such as the title, subtitle and ToC was initially extracted and stored in a database for further processing. Each book entry contains the following information: title, subtitle, authors, publication year, publisher, ToC, abstract and a list of subjects relevant to the book (manualy added by the NTUA librarians). We believe that by utilizing information from the ToC, we can better

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[1] https://www.heal-link.gr/en/home-2/

capture the topics in each book, thereby facilitating the identification of similar books [14]. Initially, there were 252 categories present in the dataset, which were mapped into fewer more general ones using the procedure detailed in, resulting in 26 categories. In our study, we selected only the primary subject as each book's label, based on an automated mapping procedure we implemented. An example of the input data after this mapping procedure is depicted in Figure *1*.

	idbook	title	toc	Label
0	99500000	Bioequivalence Requirements in Various Global ...	Brazil / Canada / China / The European Union /...	Medicine
1	99500001	Translating Molecules into Medicines	Pharmaceutical Industry Performance / Scope- p...	Medicine
2	99500003	School Inspectors	1. School Inspectors as Policy Implementers- I...	Education
3	99500004	Corporate Risk Management for International Bu...	Chapter 1- Introduction / Chapter 2- Managemen...	Economics
4	99500005	Equity Valuation and Negative Earnings	Chapter 1- Introduction / Chapter 2-The Models...	Economics

Figure 1. Example of the input data from the Springer dataset[14].

As a next step the training and testing subsets were created by randomly splitting the dataset in 80 (training) :20 (testing) ratio. We conducted experiments using the 26 resulting categories and the 5 general categories that contained most of the samples (Table *2*). The samples distribution among the 26 different categories is reported in Table *1*. By observing the tables it is obvious that the distribution of samples among the classes is imbalanced and as such, micro- and macro-average measures will be used to measure the accuracy of the classifier in order to correctly report the results for the less populated classes.

Table 1. Distribution of books for the 26 categories of the Springer corpus.

Category	No. of samples	Category	No. of samples
Anthropology	997	Linguistics	172
Art	63	Literature	5
Computer Science	11220	Management	221
Culture	24	Mathematics	4852
Economics	3767	Medicine	8471
Education	1842	Music	3
Engineering	8162	Organization	11
Environment	1394	Physical Sciences	8788
Food	4	Popular works	322
History	105	Religion	38
Humanities	815	Social Sciences	1361
Law	599	Science	34
Life Sciences	3125	Transportation	10
Total	**56405**		

Table 2. Distribution of ebooks among the 5 general categories of the Springer corpus.

Category	Total No. of samples	No. of samples	No. of samples
Computer Science	11183	8946	2237
Engineering	8047	6437	1610
Mathematics	4206	3364	842
Medicine	8315	6652	1663
Physics	3520	2816	704
Total	**35271**	**28215**	**7056**

3.2 The KALLIPOS collection of Educational Objects

The KALLIPOS Repository[2] contains a smaller collection of EO (textbook chapters) written in the Greek language and is being utilized in our studies for the purposes of highlighting multilingual issues. The KALLIPOS collection is a multi-disciplinary collection consisting of 562 textbooks both undergraduate and postgraduate, 5509 chapters and 945 other EO. The samples distribution in the various thematic categories is depicted in Table 3.

Table 3. Distribution of the Educational Object of the KALLIPOS collection.

Category	No. of samples
Mathematics and Computer Science	1496
Natural Sciences and Agricultural Sciences	1711
Engineering and Technology	1539
Medicine and Health Sciences, Life Sciences, Biological Sciences	1414
Law and Social Sciences	994
Humanities and Arts	1094
Total	**8248**

4. Methodology

4.1 SOM and DNN

The overall methodology utilized in this study has been thoroughly analyzed in [14]. Here we will focus on the main steps of the approach and explain how this methodology has been applied to the datasets presented in the previous section.
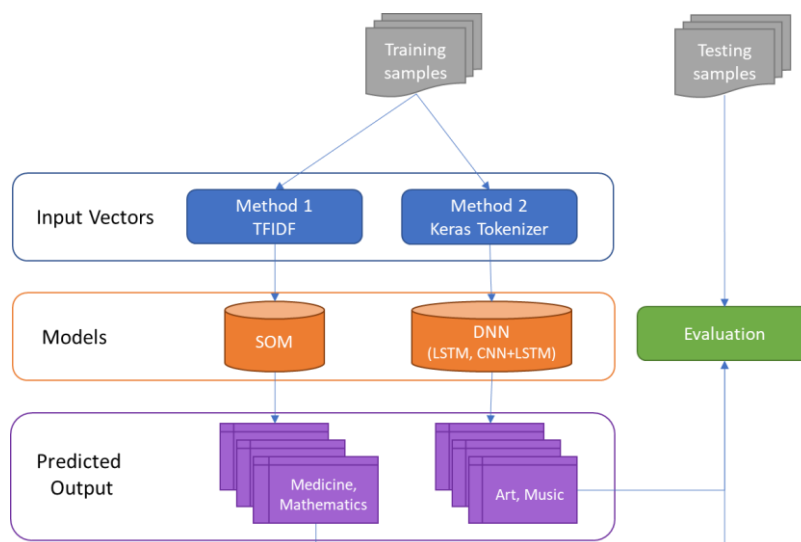

Figure 2. High level schematic representation of the proposed methodology [14].

As depicted also in the figure above, the proposed methodology utilising SOM and DNN comprises the following phases: a. Preprocessing, b. ToC vector representation, c. Training and label selection and d. Evaluation.

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[2] https://repository.kallipos.gr

Based on the NN utilized (either SOM or DNN), the preprocessing steps engaged are different. In the SOM case, and in order to omit as much "noise" as possible from the data, we had to design a more elaborate preprocessing procedure including: the removal of punctuation and numeric characters, text tokenisation (including bi-grams), stop words removal, stemming using state-of-the art stemmers like the Snowball[16] and Lancaster[15], removal of very short words and finally removal of common words (i.e., words that are usually present in most tables of contents) such as 'preface', 'introduction', 'chapter', 'references', 'appendix' etc. On the other hand, when using the DNNs we only remove the punctuation and numeric characters.

In the 'ToC vector representation' phase our aim was to select the most informative features in order to represent each ToC as a vector to be fed to the two NNs, namely the SOM and the DNN. We experimented with different vector sizes in order to find the sizes that work more efficiently while keeping the vector size relatively low, as the higher the dimension the more computationally intensive the classification task will be [14]. In the SOM case, we used the TFIDF Vectorizer[3] in order to create the vectors which were then normalized using the Euclidean norm (distance), and we experimented with different configurations in order to be able to assess the classifier's performance. The vector size ranged from 2000 to 3000 columns and we experimented with both unigrams and bigrams. In the DNN case, the Keras tokenizer, available though the Tokenizer API[4], was used for constructing the vectors. Based on the experiments conducted we ended up with the following configuration: the maximum number of words to keep in the dictionary was set to 20000, converted all words to lowercase and used the whitespace as word separator. One step that was important in this procedure, after the creation of the vocabulary index and the respective fitting in the sample TOCs, was to pad the sequence of integers with zeros in order to create fixed length vectors (800-3000 in our case) to be fed to the NN. In the last step of this phase, the labels attached to each sample were assigned to the produced vector for both NNs.

The next step is to train the NNs utilizing the vectors constructed in the previous phase. For the implementation of SOM in this paper, we used the SOMPY[5] python library and selected the batch version of SOM and linear initialisation for the input vectors for faster convergence. During the training phase the codebook vectors [14] are associated with a node in the SOM map. Then, for each training vector the Best Matching Unit (BMU) on the map is identified (i.e., the BMU that is closer to the vector based on the Euclideian distance). The same procedure is repeated for all training vectors in each epoch. After the training is completed each node on the map is associated with a set of labels. The next step is project the testing vectors on the map and predict the BMU for all of them. Based on the BMU predicted for each testing vector the corresponding label/s are selected. Different approaches have been proposed on how to select the labels, but based on our experimentation the best approach depends on the scenario whether it is a multi-class or a multi-label one. In this case, we selected the "Majority Voting" algorithm that selects the most frequent label/s for each node.

In our study we also experimented with two different DNN architectures, namely a single-layer bidirectional LSTM and a CNN+LSTM multilayer architecture with different network configurations. For the LSTM we used 64-dimensional embeddings in order to capture the temporal dependencies of the words in each ToC. The bidirectional LSTM consists of 128 features, which are passed as input to the next layer. The NN also contains two hidden layers using ReLU as an activation function, which output 64 and 32 features respectively. Finally, the output layer uses the softmax activation function and has a node for each classification label (26 or 5 depending on the classes of Tables 1-2). In our next experiment, we combined the LSTM with a Convolutional NN (CNN). The CNN consists of three 1D convolutional layers, using a scaled exponential linear unit (SELU) [17]

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[3] http://scikit-learn.org/stable/modules/generated/sklearn.feature_extraction.text.TfidfVectorizer.html

[4] https://keras.io/api/preprocessing/text/

[5] https://github.com/sevamoo/SOMPY

as an activation function. The output from the CNN is then fed into a bidirectional LSTM with one hidden layer using the ReLU activation function, which is followed by the output layer, in which softmax is used.

The final phase is the evaluation of the classifiers' accuracy using commonly used evaluation metrics. The evaluation metrics utilized in most research approaches, are precision, recall and F1-score[18], [19]. However, in multiclass settings micro- and macro-average precision measures are commonly used to evaluate the classifiers' performance [20], [21]. In our case, and due to the imbalanced dataset, we used the micro- and macro-average precision measures available through the scikit-learn python module[6], [7]. Based on the results retrieved, we reach an accuracy of 75% micro- and 73% macro-average for the SOM case, while for the DNN case the accuracy achieved is 80% micro- and 78% macro-average.

4.2 LDA

Multilabel classification with LDA entails three stages, as shown in Figure3: (A) Document Preprocessing, (B) LDA Processing (model training), and (C) Document and topic mapping to appropriate probability distributions and Label assignment. The first step of the process is to obtain the table of contents (ToC) for each document in the collection and then pre-process it to remove common and short words, while preserving word roots through stemming [15], [16] (more or less like in the SOM method, described in section 4.1 above). Preprocessing is completed with the addition of bigrams [22], [23], [24].

Following the completion of the preprocessing stage (A), LDA requires the creation of two essential artefacts: the **Dictionary** and the **trained model**. The Dictionary [25] incorporates the mapping between normalized words and their integer identifiers. In order to facilitate label assignment at the next stage (C) of the procedure, and also to improve word quality and topic coherence and discriminability, the Dictionary is constructed in a very special way: instead of getting all the words from the documents of the collection (as in the usual LDA approach), we use the standard subject terms of the Scientific Categories of the KALLIPOS Project. These subject terms are bilingual (in English and Greek) and are organized in a tree of sections and subsections under each scientific area or root Theme (Mathematics, Physics, Medicine etc.). A small part of this hierarchical tree of subject terms is shown in Table 4.

Table 4. Part of the tree of subject terms under MATHEMATICS

2	ΜΑΘΗΜΑΤΙΚΑ	MATHEMATICS
2.1	ΙΣΤΟΡΙΑ ΚΑΙ ΒΙΟΓΡΑΦΙΕΣ	HISTORY AND BIOGRAPHY
2.1.1	ΙΣΤΟΡΙΑ ΤΗΣ ΜΑΘΗΜΑΤΙΚΗΣ ΕΠΙΣΤΗΜΗΣ ΚΑΙ ΤΩΝ ΜΑΘΗΜΑΤΙΚΩΝ (ΙΣΤΟΡΙΑ ΤΩΝ ΜΑΘΗΜΑΤΙΚΩΝ)	HISTORY OF MATHEMATICS AND MATHEMATICIANS
2.2	ΜΑΘΗΜΑΤΙΚΗ ΛΟΓΙΚΗ ΚΑΙ ΘΕΜΕΛΙΩΣΗ ΤΩΝ ΜΑΘΗΜΑΤΙΚΩΝ	MATHEMATICAL LOGIC AND FOUNDATIONS
2.2.1	ΦΙΛΟΣΟΦΙΚΕΣ ΘΕΩΡΗΣΕΙΣ ΛΟΓΙΚΗΣ ΚΑΙ ΘΕΜΕΛΙΩΣΗΣ	PHILOSOPHICAL ASPECTS OF LOGIC AND FOUNDATIONS
2.2.2	ΓΕΝΙΚΗ ΛΟΓΙΚΗ	GENERAL LOGIC
2.2.3	ΘΕΩΡΙΑ ΜΟΝΤΕΛΩΝ	MODEL THEORY
2.2.4	ΥΠΟΛΟΓΙΣΙΜΟΤΗΤΑ ΚΑΙ ΑΝΑΔΡΟΜΗ	COMPUTABILITY AND RECURSION THEORY
2.2.5	ΘΕΩΡΙΑ ΣΥΝΟΛΩΝ	SET THEORY
2.2.6	ΘΕΩΡΙΑ ΑΠΟΔΕΙΞΕΩΝ ΚΑΙ ΚΑΤΑΣΚΕΥΑΣΤΙΚΑ ΜΑΘΗΜΑΤΙΚΑ	PROOF THEORY AND CONSTRUCTIVE MATHEMATICS
2.2.7	ΑΛΓΕΒΡΙΚΗ ΛΟΓΙΚΗ	ALGEBRAIC LOGIC
2.2.8	ΜΗ ΤΥΠΙΚΑ ΜΟΝΤΕΛΑ	NONSTANDARD MODELS
2.3	ΣΥΝΔΥΑΣΤΙΚΗ	COMBINATORICS
2.3.1	ΣΥΝΔΥΑΣΤΙΚΗ ΑΠΑΡΙΘΜΗΣΗΣ	ENUMERATIVE COMBINATORICS
2.3.2	ΣΧΕΔΙΑΣΜΟΙ ΚΑΙ ΔΙΑΜΟΡΦΩΣΕΙΣ	DESIGNS AND CONFIGURATIONS
2.3.3	ΘΕΩΡΙΑ ΓΡΑΦΩΝ (ΓΡΑΦΗΜΑΤΩΝ)	GRAPH THEORY

At this stage, we also form the standard 'Theme documents', corresponding to the sections of the subject terms' tree and inheriting the associated subject labels. Once the Dictionary has been created, the LDA Model can be trained. The entire set of documents from the given dataset is used as training data [26]. The training procedure results in a set of topics, represented as probability distributions across the words of the Dictionary.

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[6] http://scikit-learn.org/stable/auto_examples/model_selection/plot_precision_recall.html
[7] http://scikit-learn.org/stable/modules/generated/sklearn.metrics.precision_recall_fscore_support.html

The topic model takes the form of a list, where each pair consists of a topic identifier and a set of words, each of which is followed by the probability that it is associated with the topic.

At the last stage (C), the descriptions of the documents as distributions over the discovered topics are transformed to distributions over labels. At first, the Theme documents feed the LDA model, in order to be described as topic mixtures (as the ordinary documents do). Under certain assumptions (Themes do not overlap and their union gives the entire Dictionary), simple Bayesian reasoning is used to express the topics of the model as distributions over the Themes and, consequently, as distributions over the labels, associated with the Themes. At a final step, the same transformation is performed for each document in the dataset. The study of this method is ongoing, with the first results being very encouraging. We calculated precision and recall metrics for a test dataset, labeled with the Springer's general categories to assess the effectiveness of the method. As of now the metrics showed a recall score of nearly 65% and a precision score of over 76%, resulting in an F1-score of 70%.
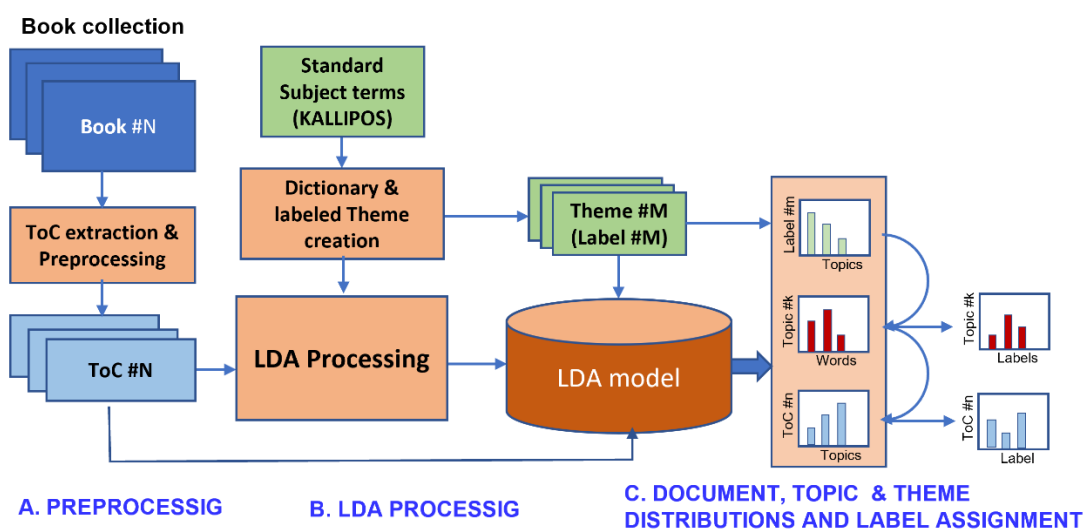

Figure 3: LDA workflow

5. Application Examples

This section presents examples of the application of the proposed methods. As mentioned also previously, the proposed approaches could be used effectively to recommend educational material to support teachers and students in locating relevant sources of content. More specifically, using a more detailed description of the topic the user is searching for (e.g., the table of contents of a known book, rather than simple keywords) can lead to more accurate results. Illustrative examples from this usage scenario are given below.

5.1 A SOM application example

Figure 4, depicts the trained SOM map as well as the labels placed on each node after the training phase using the Majority Voting algorithm.
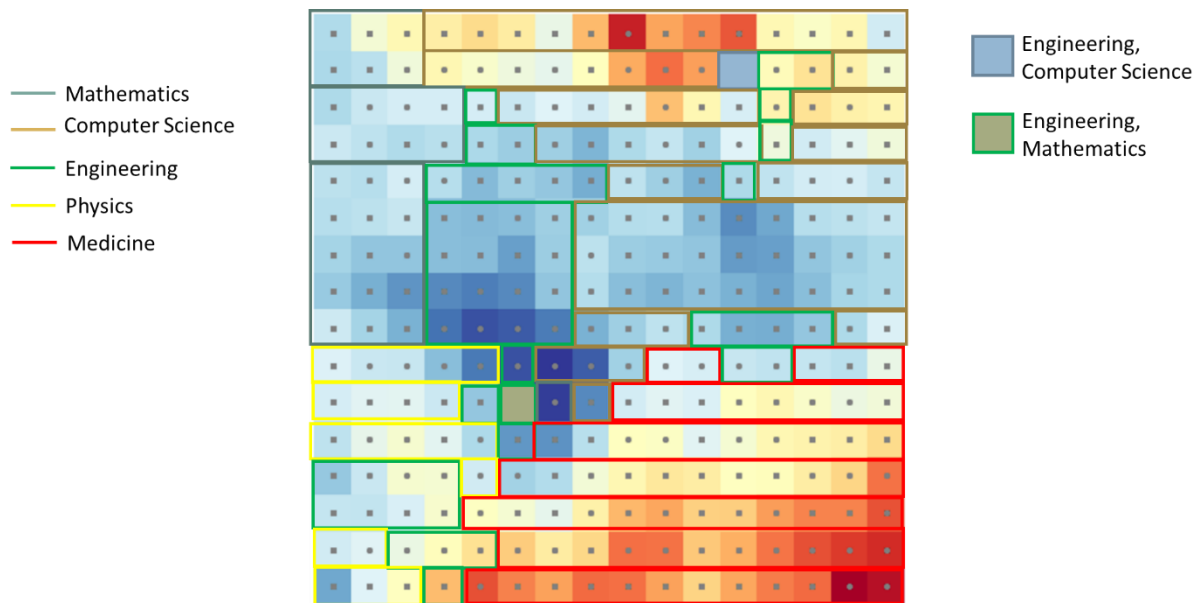
Figure 4. An example of the trained SOM map distinguishing the labels assigned to each node based on the colors explained in the legend.

Certain conclusions can be deducted from the above map. Initially, the two classes 'Mathematics' and 'Medicine' appear to be completely distinct on the map, the class 'Mathematics' occupies the upper left part of the map while the class 'Medicine' occupies the lower right. Another remark is that there is an overlap between the 'Engineering' and 'Computer Science' classes which occupy the upper right part of the map. This is expected as in reality these classes are quite close and many times the differentiation between them is not easily distinguishable. Another thing worth mentioning is that in the above map there are two nodes that have two labels at the same time even after applying the Majority Voting algorithm. For this reason, they are marked on the map with a different color display compared to the others. On the first node the labels 'Engineering' and 'Computer Science' have been assigned while on the other node the labels 'Engineering' and 'Mathematics' have been assigned. This means that the sum of the training samples from each class assigned to the node is exactly the same, and as such the algorithm cannot choose one of the two labels as the dominant one.

Table 5 presents some indicative examples and the respective outputs when using the trained map presented above and giving as input tables of contents of books. At this point is should be mentioned that the books given as input were not used during the training phase and as such are not known to the network. This is an essential step to test whether they can be correctly classified in practice. Similarly, Table 6 depicts the outcomes of the system when giving a book as input in order to retrieve similar books.

Table 5. Examples of the labels selection when providing the books as input.

Example No.	Title	Label assigned from Librarians	Predicted Label
1	Exciting Interdisciplinary Physics	Physics	Physics
2	Machine Learning in Medical Imaging	Computer science	Computer science
3	Generalized Measure Theory	Mathematics	Mathematics
4	Nutrition and Gastrointestinal Disease	Medicine	Medicine
5	Dynamic Response of Linear Mechanical Systems	Engineering	Engineering

6	E-Democracy Security Privacy and Trust in a Digital World	**Computer science**	**Engineering**
7	Innovations in Computer Science and Engineering	**Engineering**	**Computer science**
8	Modeling Thermodynamic Distance, Curvature and Fluctuations	**Engineering**	**Physics**
9	Magnetic Fields in Diffuse Media	**Physics**	**Physics**
10	Minimally Invasive Cancer Management	**Medicine**	**Medicine**

Table 6. Examples of the books retrieved as similar when providing one book as input.

Example No.	Title	Similar books retrieved
1	E-Democracy Security Privacy and Trust in a Digital World	European Identity through Space
		Critical Information Infrastructures
		Maritime Governance and Policy-Making
		Cybersecurity in Israel
		Blockchain Enabled Applications
2	Exciting Interdisciplinary Physics	Kinetic Simulations of Ion Transport in Fusion Devices
		Helioseismology Asteroseismology and MHD Connections
		The Electromagnetic Spectrum of Neutron Stars
		Light and Light Sources
		Asteroseismology of Stellar Populations in the Milky Way
		Atomic Processes in Basic and Applied Physics
3	Innovations in Computer Science and Engineering	Proceedings of Fifth International Conference on Soft Computing for Problem Solving
		Emerging Trends in Computing and Communication
		Computational Intelligence in Multimedia Processing: Recent Advances
		Software and Network Engineering
		Proceedings of the 4th International Conference on Computer Engineering and Networks
4	Minimally Invasive Cancer Management	Diagnostic Endosonography
		Endoscopic Diagnosis of Superficial Gastric Cancer for ESD
		Inflammation and Gastrointestinal Cancers
		Pancreatic Cancer
		Atlas of Head and Neck Cancer Surgery

5.2 An LDA application example

Applying LDA, as described in section 4.2, to the Springer dataset, with 26 topics (equal to the number of categories in this dataset, identified in section 3.1) gives the probability distributions of Topics over Labels reported in Table 7 (deployed horizontally). For each topic the most significant Label is colored in deep green and the less significant ones in lighter green.

Table 7. Topic distributions over the standard labeled Themes.

Topic #	MATHEMATICS	COMPUTER SCIENCE	HEALTH SCIENCES	TECH SCIENCES & ENGINEERING	PHYSICAL SCIENCES
15	0,910917711	0,014849439	0,007096451	0,02245119	0,044685214
11	0,890370029	0,072014154	0,002880902	0,00798682	0,026748097
18	0,809368564	0,066368075	0,027576756	0,01282419	0,083862411
23	0,029075368	0,803179285	0,020118094	0,08338219	0,064245065
14	0,235395211	0,66530851	0,013476617	0,03610227	0,049717388
9	0,037946987	0,663188971	0,043205426	0,15447462	0,101183994
25	0,018027298	0,086419823	0,793943714	0,06691034	0,034698821
17	0,059372756	0,034583823	0,718172603	0,13613566	0,051735162
1	0,148710929	0,036300991	0,512902953	0,16706727	0,135017858
6	0,043690537	0,247788342	0,042347472	0,60406661	0,062107041
4	0,094907076	0,038874495	0,046210502	0,53957279	0,280435138
21	0,048005908	0,335694835	0,113045051	0,47414148	0,029112721
19	0,070537625	0,046535957	0,006112329	0,07465138	0,802162705
8	0,012195863	0,015316437	0,018121458	0,4460755	0,508290745
20	0,089537139	0,127377948	0,264977032	0,18497868	0,333129201

The fifteen topics shown in Table 7 (out of the 26 used in the LDA analysis), exhibit a relatively good orthogonality behavior, in the sense that they are concentrated in few Themes each. The first three, in particular are confined within MATHEMATICS with a percentage close to 90%. Topics #6, 4 and 21 are shared between two Themes: TECH SCIENCES & ENGINEERING (the most significant), on the one hand and COMPUTER SCIENCE or PHYSICAL SCIENCES, on the other. The same holds true for Topic #20. This spread is expected, as noticed also in the results of the other methods, presented at the beginning of this section.

6. Conclusions and next steps

In this paper, we presented the use of an unsupervised NN (SOM), two DNN architectures and the well-known LDA algorithm, as well as indicative application examples in multiclass and multi-label settings utilizing the Springer dataset analyzed in Section 3.1. The feature selection approach is designed to be as generic as possible to ensure its applicability to other datasets with minor modifications. All the methods presented in this paper utilize information from the ToC of each ebook for the vector construction. It should be mentioned that the added value of the approaches presented in this paper is the exploitation of the similarity of ebooks or EO that belong to the same or similar cluster. Using this similarity, we are able to identify similar ebooks or EO for each category and vise versa. For example, we could use a book belonging on the category to find similar ones or we can use a totally new ebook and find the category that this ebook belongs to as presented in Section 5 for both the SOM and the LDA methods. Furthermore, in the LDA case, we can retrieve semantically similar documents using the Jensen Shannon divergence[27], since each document is represented with a probability distribution of topics. This subject is still under study.

From the above it is obvious that by leveraging the ToC information, we can obtain a better view of the ebooks and EO contents while being able to determine which books are similar even though they may not share the same keywords in their ToCs. We should also highlight, that we do not expect 100% classification accuracy as

the label allocation is subjective due to the fact that it is performed by humans. Moreover, due to the correlation of some categories (i.e., 'Computer science' and 'Engineering') even though the system may classify a book as belonging to 'Engineering', it can also belong to 'Computer science'.

The methodology that is described here can be further extended in various ways. In the next steps, we consider the further experimentation with the KALLIPOS dataset in order to obtain better results in terms of accuracy by tuning the NNs used and by assessing the results in order to finetune the modelling approach followed. It should be noted that the KALLIPOS dataset poses specific challenges as it is multilingual one. Finally, another extension of this paper would be to use more specific categories as labels and retrain the networks in order to be able to identify hierarchies within categories.

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Staff Support Services in Digital Education

Professional Development of Tutors in Distance Education: A Case Study of a postgraduate programme at the Hellenic Open University

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Abstract

The Hellenic Open University (HOU) aims to fill the gap in open Higher Education in Greece by offering exclusively distance education (DE), an alternative way of organizing studies and modern methods for teaching. HOU' s tutors are the key factor for improving the quality and efficiency of teaching, however a fairly large percentage of them derived from the traditional education, so they lack experience and information on methodological issues on DE. Consolidated beliefs and stereotypes from their work in traditional education, accompany their teaching at HOU. However, both the literature review and research in the HOU (Papadimitriou, 2014; Ioakimidou, 2018) highlight that a different approach to learning with active participation, dialogue and sharing within learning communities is necessary. Besides, tutors in DE need professional development opportunities on various levels, within the institution, on a national level or/and on an international level (Tait, 2021). Afterall, tutors in DE need to become flexible leaders that respond to challenges in a humanitarian and passionate way (Olcott, 2020).

The professional development of tutor-counselors in Higher DE has been explored in the cases of Open Universities in the UK and South Africa, the Indira Gandhi National Open University in India, and the Athabasca Open University in Canada (Cornelius & Macdonald, 2008; Latsem, & Lockwood, 1998). The collaborative professional development model of the Queensland University of Technology in New Zealand is highlighted through a network which leverages the collaborative approach through voluntary and interdisciplinary network training. Furthermore, collaborative practices as peer learning, mentoring, communities of practice are studied at the Open University in the UK.

This paper aims to explore tutor support practices in the HOU. The case study explores the main components for tutor's professional development. The informants in this research paper are new tutor-counselors teaching with no previous experience in DE in two modules (ETA62 & ETA63) in the postgraduate programme entitled "Education and Technologies in Distance Teaching and Learning Systems – Education Sciences".

The survey conducted during the spring semester in 2022 reflects the current situation of new entrants and explores their views on the context of DE, their needs, the necessary elements of a supporting mechanism and their proposals for professional development.

Two focus groups with new tutors, one for each module, were conducted with a protocol of indicative questions based on the manual "E-xcellence", (EADTU, 2016), and previous research

(Papadimitriou, 2014; Ioakimidou, 2018). The focus groups were conducted online and recorded digitally. The data gathered were organized, coded, and analyzed.

Keywords: tutors, professional development, distance education, open universities, academic staff

1. Introduction

The Hellenic Open University (HOU) aims to fill the gap in open Higher Education in Greece by offering exclusively distance education (DE), an alternative way of organizing studies and modern methods for teaching. HOU' s tutors are the key factor for improving the quality and efficiency of teaching, however a fairly large percentage of them derived from the traditional education, so they lack experience and information on methodological issues on DE. Consolidated beliefs and stereotypes from their work in traditional education, accompany their teaching at HOU. However, both the literature review and research in the HOU (Papadimitriou, 2014; Ioakimidou, 2018) highlight that a different approach to learning with active participation, dialogue, and sharing within learning communities is necessary. Besides, tutors in DE need professional development opportunities on various levels, within the institution, on a national level or/and on an international level (Tait, 2021). Afterall, tutors in DE need to become flexible leaders that respond to challenges in a humanitarian and passionate way (Olcott, 2020).

The aim of this paper is to research the main components for tutor's professional development in open universities based on tutor support practices in the HOU.

In the context of this paper the terms teacher, educator, tutor, or tutor-counselor, as they are often called at the HOU, are used as synonyms and they all refer to the academic staff in open universities.

The paper begins with a theoretical approach on issues related to tutors' professional development in open universities. Then, a case study with new tutors at the HOU is presented and finally discussion, conclusions, and suggestions for further research follow.

2. Professional development of the academic staff in open universities

2.1 Why we need PD in OU

Quality systems either targeting to quality assurance or quality enhancement include staff development (Khoo & Idrus, 2004) as an effective vehicle to promote changes. Educators are the key factor for improving the quality and efficiency of education. A tertiary educational institution should offer motivation and infrastructure to their educators to enable and engage them to continuously enhance their teaching (Biggs, 2001: 229).

A large percentage of scientists who consists of the academic staff of open universities worldwide derived from conventional education. They have extensive expertise in their scientific field; however, they lack experience and knowledge on methodological issues of distance education (Papadimitriou, 2014).

Focusing on the open Higher Education, the role of the tutor-counselors has a significant impact on adult students' studies. Therefore, staff development especially on issues of teaching and learning has become a necessity for open universities to assure the quality in students' learning experience in the context of the unique features that characterize distance education. This becomes even more important if we consider that common practices, common understanding, stances, and values included in the institution's culture signify its philosophy and special character (Lionarakis, & Vavouraki, 2005). Professional development of the academic staff in open universities could be summarized (Cannell, & Gilmour, 2013; Kirkpatrick, 2005; Lionarakis, & Vavouraki, 2005; Papadimitriou, & Lionarakis, 2015; Ossiannilsson et al., 2015; Thomas, 2002) on the following aspects:

- familiarization with basic concepts related to open and distance education,

- familiarization with strategies and techniques of assessment and feedback,
- designing and implementation of inclusive stances, attitudes and understanding in teaching, learning and assessment processes,
- active, engaging, and student-centered teaching techniques in open and distance education,
- possibilities of interaction in open and distance education,
- practice on the new role of teaching and guiding,
- design and development of appropriate educational material,
- models of effective / quality teaching in open and distance education.

2.2 **Informal professional development**

The academic staff in open universities participate in various initiatives to enhance their skills and knowledge beyond formal professional development. For example, participation in Massive Open Online Courses (MOOCs), seminars and workshops, contribution in conferences, co-operations and contacts with colleagues, communities of practice (CoP) and professional learning networks (PLN). Participating in CoPs and PLNs, tutors shape a common understanding, build strong relationships through activities of dialogue and reflection, contribute to appropriately designed procedures and practices. One of the key challenges for e-learning communities is how best to create and sustain an online environment that educators wish to contribute to on a regular basis, according to Dalziel (2010). Communities of practice have an essential role in distance learning (Palloff & Pratt, 1999). Interactions within the community are continually transforming procedures, therefore each group is characterized by its own potential.

The meta-analysis of Johnson & Johnson (1990) highlights the value of collaboration in the learning process:

- Students working in a collaborative and non-competitive learning environment, have better performance,
- Students participating in groups solve easier problems,
- Students participating in groups, use more methods and metacognitive strategies,
- Collaborative learning cultivates higher level of thinking,
- New ideas and innovative solutions are being produced in working groups.

A rapidly growing category of social networks that support informal learning between people of similar interests are "Professional Learning Networks" aimed at professional development, respectively. Professional Learning Networks (PLN) are built with the aim of informing and sharing educational topics, exchanging knowledge, resources, applications, participating in discussions with the global community of educators. An important characteristic of PLN is the personal choice of teachers to get involved to further develop their knowledge, skills, and attitudes (Nielsen, 2008; Utecht, 2008).

2.3 **Formal Professional development**

Open universities use a variety of methods and services to achieve professional development (PD) of their academic staff. Official methods and services include tutors' mobility, implementing seminars and workshops, mentoring, coaching, web-based supporting platforms, providing toolkits, guides, and digital resources (Papadimitriou, 2014).

Mentoring is a popular practice in the Open University / UK (Cornelius & Macdonald, 2008; Papadimitriou & Lionarakis, 2016; Simpson, 2002). According to international views, mentor is the more experienced or the older tutor who shares knowledge with others less experienced, the mature professional who guides younger protected colleagues and in that way the feeling of loneliness is decreased (Alabi, 2017). The mentor offers knowledge on the working subject, knowledge on how a subject could be taught, knowledge on the institution's policy. He/she also offers advice about the protector's professional path, his/her professional

development and emotional support (Kutsyuruba et al., 2019). He/she points strong and weak elements in the protector's work, and he/she offers opportunities for reflection (Fasoulis, 2016; Kutsyuruba et al., 2019) working always on a pedagogical base (Goga & Goga, 2007). The mentor becomes the model for the younger apprentices to follow showing his/her commitment towards the educational institution, its special character and its orientation, especially when it comes for an open university focused towards a broaden access and offering high quality learning opportunities through teacher / student relationship and values like respect on individual differences (Thomas, 2002).

Another emerging practice to support tutors coming mainly from e-learning in the USA (Goga & Goga, 2007) is coaching. The coaching helps other educators to enhance their performance based on their skills and capabilities. Mentoring is considered broader than coaching as it focuses and goes deeper to more differentiated, individual, even personal issues, while coaching focuses on professionalism, attachment to the target through cooperation (Fasoulis, 2016).

Both, mentoring and coaching, rely on theories of professional learning (constructivism, organizational learning, cognitive theory of skills) where the professionals augment the possibilities to learn through close cooperation with experienced colleagues and these are low cost and high benefit choices (Fasoulis, 2016).

Terms developed to fit in the field of professional development of tutors in universities include "change agent", "faculty developer", "educational developer", "academic staff developer" και "professional developer", that in essence they refer to the person in a university responsible for tutors' professional development in the institution especially on their pedagogical and didactic work (Clavert, Lofstrom & Nevgi, 2015; Papadimitriou & Lionarakis, 2016).

Professional development in the Open University UK

The Open University UK is implementing a "Human Resource (HR) Development Strategy" (Sewart, 1998). A primary element of the HR Strategy is the process of entering the university, which includes three phases of processes: "recruitment", "selection" and "joining". All new tutors are supported with pre-service training for their role and courses. The second element of the strategy is the "Staff training departments", which are mandatory, carried out locally and face-to-face. The "Staff training departments" often contain explanations and guidance from the creators of the educational material, and they are financially covered by the university. Additional documentation is provided via the "Reference File", and a variety of 'Toolkits' covering broad areas such as "Effective Tutorials", "Revision and Examinations" as well as specialist areas such as "Students with disabilities". The third element of the strategy is the matching of a mentor to each new entrant. The mentor is an experienced Associate Lecturer who provides informal peer support during the first year and remains a pre- and post-teaching support contact throughout this period.

Professional development in the IGNOU

The "Division of Distance Education" of the Indira Gandhi National Open University (IGNOU) aims to provide development, support, and training to its academic staff. The provision of training works on three levels:

- short programs for the immediate needs of the not permanent staff,
- medium-term training programs for permanent staff with workshops,
- long-term training.

Professional development in the UNISA

Two innovative and flexible programs that seemed to have the potential for transferability are the "Resource-Based Career Preparation program" from the University of the Free State and the ABET ("Adult Basic Education and Training") from the "ABET Institute of the University of

South Africa" (UNISA). These two programs are ventures that show how properly designed distance programs can lead to effective learning. According to Rhandell, & Bitzer (1998), the development of the educational staff follows the following axes:

- design of appropriate support systems
- change of 'outdated perceptions' of the staff
- empowering staff to support personalized learning

Professional development in the Queensland University of Technology

The "TRAC network" (Teaching, Reflection and Collaboration) is a voluntary cross-disciplinary professional education network consisting of 13 groups with interests in teaching and learning at Queensland University of Technology, which has essentially achieved the bottom-up approach to professional development with the co-shaping of the framework by the tutors themselves. Its groups emerged after five years of operation of the network are:

- Problem Based Learning (PBL)
- Understanding of Student Learning (USL)
- Collaborative Teaching and Learning Strategies (CLATS)
- Teaching and Learning in Large Classes (TALLC)
- Supervision of Postgraduate Studies (PGS)
- Pluralism in teaching and learning (VITAL)
- Use of Technology in Education (UTE)
- Interpersonal Relations in Teaching and Learning (ITAL)
- Teaching Acquisition of Information Literacy Skills (TAILS)
- General Skills in Undergraduate Studies (GENIUS)
- Intercultural Education Program (CCC)
- The Role of Assessment in Learning (RAIL)
- Laboratory Teaching (LABTEACH).

3. Professional development of the Academic Staff in the HOU

3.1 **Formal Professional development in the HOU**

The units of Educational Content, Methodology and Technology Laboratory (e-CoMeT-Lab), the Library and the Unit of Evaluation (UE) in cooperation with the Coordinators of the tutors in each module and the Curriculum Directors play a key role in academic staff development policy in the HOU.

The Library contributes to the strengthening of the knowledge horizon of tutors in DE methodology by providing resources of information (books, e-books, journals, online journals), bibliography, as well as by informing and facilitating them on the capability of accessing relevant online educational sites.

The unit of Library in the HOU connects with the "Library and Information Center OPAC" ("Online Public Access Catalogue") and tutors can use the search options to locate Library items. Various options of searching effectively are available as the Summon Discovery Service, the "MITOS Catalogue", the "HALUC – Hellenic Academic Libraries Union Catalog, the National Archive of PhD Theses", and "Open Archives". Through the "HEAL-Link Portal" members have full-text access to journals, e-books and to bibliographic databases. Access is allowed through IP address recognition and "My-HEAL-Link", which is a personalization service, does not conflict with this process.

The *e-CoMeT-Lab* operates as an independent unit in the HOU and supports HOU in applying educational, methodological, and technological innovation in DE and educational content development. Based on the importance of the educational material in relation to the quality of the education provided, the *e-CoMeT-Lab* coordinates the process of developing digital educational content in compliance with international standards. In this context, the *e-CoMeT-Lab* has written pedagogical specifications according to the principles of DE as well as up-to-

date scientific and technical specifications providing full technical support and training to developers.

3.2 MOOC for new tutors' training

The HOU has offered a Massive Open Online Course (MOOC) aiming to train the new tutors in the field of Open, Distance Education, and adult learning and the specific methods used in the HOU. The MOOC lasts four weeks focusing on adult distance education in HOU, organizing, monitoring, and evaluating in distance education. Enrolled tutors could form a consolidated shared culture of quality in the teaching methods, which perhaps they will apply for the first time either in the context of teaching in an annual or six-month thematic unit of an Undergraduate or Postgraduate Program, or as supervisor of a dissertation.

The MOOC entitled "Training for the members of the Academic Staff" for Open and Distance Education was developed by the *e-CoMeT-Lab* and has been offered to new tutors since 2020. Tutors involved in this MOOC, can find that there is a generally accepted system of perceptions, values and actions that facilitates their work and furthermore guards the quality of the HOU's educational processes. Tutors enrolled in the course have the opportunity to get a certificate after passing successfully an evaluation process.

3.3 The role of the Coordinator

The **Coordinator** of each module has the lead role in a staff support system in the HOU. According to the [official site of HOU](#), the Coordinator of the module regulates the tutors' work; he cares for the common orientation of the activities, the common topics of the written assignments and the final exams. He also evaluates tutors' work. Among other things the Coordinator (HOU, 2022):

- prepares, organizes, and conducts staff meetings,
- forms the topics of the written assignments and the final exams, indicative answers, indicative ways of assessing them and criteria of assessment,
- supervises the construction of a timetable for students' work, the on-line or face-to-face meetings and he/she faces the complaints coming from students,
- evaluates the job applications of older and new tutors and he makes relevant suggestions to the Committee responsible to decide who should be hired,
- cooperates with the administrative units and departments in the HOU like the Evaluation Unit, the *-CoMeT-Lab* or the Library.

The role of the Coordinator is multidimensional and he is considered a key factor for the operation of each module, tutors' work and students' learning progression. This role becomes more interesting when practices like mentoring and coaching are adopted.

4. The case study

4.1 The context

This paper aims to explore tutors' support practices at the HOU. The informants in this research paper are new tutor-counselors teaching with no previous experience in distance education in two modules (ETA62 & ETA63) in the postgraduate programme entitled "Education and Technologies in Distance Teaching and Learning Systems – Education Sciences". This programme started two years ago in the middle of COVID19 crisis, when distance education became the only way to keep the educational processes active. These circumstances made the programme popular with hundreds of people showing their will to participate. The large number of students created the need for too many new tutors highly educated but without experience in open and distance tertiary education. This generated the need for professional development in various forms. The case study in this research explores the components for tutor-counselor's professional development.

4.2 **Research design**

The review followed a flexible research design evolving during data collection (Robson, & McCartan, 2016). The survey conducted during the spring semester in 2022 reflects the current situation of new entrants and explores their views on the context of distance education, their needs, the necessary pillars in a supportive mechanism and their suggestions for professional development.

Two focus groups were conducted, one with new tutors in ETA62 and the other one with new tutors in ETA63. In each focus group five tutors participated with a protocol of indicative questions based on the manual "E-xcellence", (Kear et al., 2016), and previous research (Ioakimidou, 2018; Papadimitriou, 2014). The informants formed a convenience sampling as the researchers participated in the two modules as tutors.

Internet-based focus groups are an increasingly popular research method, and the choice of homogenous groups (5 informants in each focus group: 4 women and a man, all teaching in the same module) was made to facilitate communication and to offer a sense of safety while the participants had the opportunity to interact with each other (Bryman, 2008; Robson, & McCartan, 2016). Each focus group lasted for approximately one hour. In both cases while on teleconference one researcher was the moderator of the discussions and the other one audio-taped and kept notes in the focus groups. The focus groups were transcribed, and content analysis with some quantitative data coming out of qualitative data (Robson, & McCartan, 2016) was used to make meaning out of the data collected. The process was facilitated using the open-source web-based document tagging tool for qualitative data analysis, "Taguette" (https://app.taguette.org/), ~~an open access software~~ for trustworthy and transparent results. The themes came out of literature review. These were then coded, while sub-codes were derived from what the informants discussed. The informants' answers were analysed all together as there were not significant differences observed.

4.3 **Results & Findings**

At first the data analysis led to the codes and themes shown in Table 1. Results and findings are presented top down starting from the most popular theme and code in the informants' discussions. Tutors main concern seems to be teaching and learning. While they comment on their needs, they make suggestions on ways that they could be supported. They mention various professional development processes and alternatives, though only a few of them discuss about administrative, library, even ICT support.

Table 1: Codes and themes from the focus groups

tag **/ code**	description **/ theme**	number of highlights
teaching and learning	support on teaching and learning issues like the educational material or teleconferences with students	63
needs	new tutors' needs at the HOU	44
suggestions	suggestions for a support mechanism for new tutors	27
professional development	new tutors' professional development at the HOU	24
staff support	administrative, library and technical support to new tutors	11

On a next level of analysis, the codes were analysed on sub-codes as shown in Tables 2-6. At that point analysis goes in more depth.

Tutors recognize team support and collaboration as the most valuable and empowering tool in their work. They feel they understand, and they effectively support each other, they share

their anxieties, and the workload is reduced when they cooperate. At the same time, tutors in focus groups highlight the role of the Coordinator and the Assistant Coordinator. These can create a safe environment for the tutors to be able to pose questions and search for answers. The Coordinator, and the Assistant Coordinator, are responsible for introducing newcomers to open and distance education, as well as to the specific characteristics of the open educational institution. A tutor in a focus group comments:

> This direct communication that existed here and does not exist in the traditional university, helped me to have this confidence that whatever happens we will deal with it, we will find a solution, we will find whatever is needed.

In tutors' meetings they build new experiences, and self-confidence working in safe environment where all together search for ways to support their students. Issues on which tutors need support are preparing and developing teleconferences with their students ("Group Consultation Meetings" - OSS), establishing and keeping up good communication with their students, developing effective ways to support educational material, supporting students to achieve good results on written assignments and final exams, assessing assignments and final exams papers (Table 2).

Table 2: Tutors' support on teaching and learning issues

code: teaching and learning	
sub-code	number of highlights
tutors' meetings / teamwork	28
Coordinator / Assistant Coordinator	26
distance education	10
Group Consultation Meetings (OSS)	9
self-confidence	8
experience	4
tutor/student communication	4
educational material	2
written assignments	1
final exams	1

Tutors' meetings, team support and teamwork seem to be what tutors need the most. A tutor in a focus group comments:

> The team is very cohesive, very close, it's like a family. It's a very nice feeling. … It all reflects to the students.

They also need to develop skills and knowledge mainly on open and distance education issues as most of them don't have previous experience in the field or in the HOU. The Coordinator, and the Assistant Coordinator's support tutors on various levels offering, for example, effective feedback. Besides these experts bridge the gap between teachers' experience in traditional universities with the educational material and its central place in distance education. Tutors need to familiarize themselves with the platforms used in the ETA programme. They also need information on the content of previous modules their students attended and background studies. A way for the tutors to cover their needs is professional development (Table 3).

Table 3: Tutors' needs

code: needs	
sub-code	number of highlights
tutors' meetings / team support / teamwork	13

building skills & knowledge	10
open & distance education / no previous experience	10
Coordinator's / Assistant coordinator's support	8
teaching material	3
digital platforms	2
feedback	2
students' background studies	2
professional development	1

Tutors suggested professional development on trends in distance education like mobile learning, chatbots, artificial intelligence, virtual reality, gaming, but also on the broader philosophy and function of open and distance education.

> *This culture of open and distance learning, of support and collaboration, should be extended to other modules, other programmes, and other universities.*

MOOC or a series of videos are proposed as a possible form of professional development for newcomers. What tutors suggest in a presentation of the programme and its content at the beginning of the semester to know what students have studied so far. A forum could help them to interact and help each other. Furthermore, a repository could help with teaching examples and best practices. An automated digital avatar, which would provide solutions to a series of common technical issues, and routines, is another idea that came up, while a need for new tutors is familiarization with the platforms. Library is another agent that could provide support, teamwork, and tutors' cooperation (Table 4).

Table 4: Tutors' suggestions

code: suggestions	
sub-code	**number of highlights**
professional development	9
students' experience in the programme	4
forum	3
repository with examples	3
teaching material	3
an avatar for technical support	2
library seminars	2
a video with the basics	1
tutors' interaction & cooperation	1
training on platforms	1

The informants refer to professional development mentioning various forms like learning communities and communities of practice among tutors, conferences and seminars, MOOCs, participation in fora and networks, mentoring.

Table 5: Tutors' professional development

code: professional development	
sub-code	**number of highlights**
learning community / community of practice	6
conferences & seminars	5
digital platforms	4
MOOC on distance education issues	4

forum / networking	2
open & distance education	2
mentoring	1
pedagogical issues	1
assessment & reflection	1
teaching & learning material	1

The content of professional development could be about the digital platforms used in the HOU, open and distance education issues, pedagogical issues, assessment and reflection, teaching and learning material (Table 5).

> *There are things that people must explain to you like how to deal with and how to be ready to answer academic type questions, how to create these conditions of cooperation and generally to show how open the programme is and what is this philosophy that they experience.*

Finally, staff support includes technical training, as well as library and administrative support (Table 6).

Table 6: Staff support

staff support	
sub-code	number of highlights
library support	5
technical training	5
administrative support	1

5. Discussion

ETA62 and ETA63 are the last two modules that students choose to attend, instead of writing a dissertation, and that burdens them with the anxieties of completing the programme without unexpected constraints. The role of the tutors in those modules is slightly differentiated as they need to empower their students emotionally, to calm down their stress, to advise them, and to support them to success.

In the research new tutors at the HOU highlighted their role and their professional needs articulately, they made suggestions for a support mechanism, and they mentioned various training forms.

Regarding teaching and learning issues in Table2, new tutors highlighted tutors' meetings / teamwork at a high extend and the role of the Coordinator / Assistant Coordinator. Both of them agree with literature review (Cannell & Gilmour, 2013; Kirkpatrick, 2005; Lionarakis & Vavouraki, 2005; Papadimitriou & Lionarakis, 2015).

The informants underline the importance of collaboration and teamwork to share the work and reduce the workload, to share their anxieties and their worries, to experience this peer interaction, a desirable option for their students too. So, in a safe environment they experience what they will plan and develop for their students too, a community of learning is formed that way. Collaborative practices and learning, common goals, shared responsibilities, democratic decisions, and understanding are the basic pillars for a quality culture and quality enhancement in this context.

The Coordinator or/and the Assistant Coordinator are the leaders and the mentors that will support and guide by their example, they will council and they will inspire other tutors. They are the ones who will introduce the newcomers to the characteristics and the profile of the educational institution, the programme and the module (Papadimitriou, 2014). They will empower newcomers to face various challenges like tutor/student online meetings,

tutor/student communication, providing teaching material, supporting the educational material, assessing, and grading written assignments and students' papers in final exams.

So, what tutors need is the team and its leader to support them on building skills, and knowledge on issues of open and distance education, and to manage digital platforms used at the HOU (Table 3). Tutors should be competent and confident while working with online tools using them in innovative pedagogical teaching practices, so institutions should empower tutors towards this direction (Keržič et al., 2019). Another key point, on which tutors need support, is how can they offer effective feedback to their students' work. There is no quality without assessment, and there is no assessment for learning without effective feedback (Austen, & Malone, 2018; Hattie, & Clarke, 2019).

New tutors made concrete suggestions regarding their professional development such as teaching material, an avatar for technical support, tutors' interaction & cooperation, a repository with examples (Table 4). An example of best practice aiming to openness and sustainability is the repository of possible learning activities. All tutors contributed to a common repository for sharing collaborative learning activities during the tutorials. The repository has remained active. Its material is provided to new tutors of the next academic year, and they constantly enrich it. While there are some similarities with the outcomes of literature review like seminars and workshops (Rowntree, 1997), the informants in this research referred to modern forms of formal or informal professional development like tutors' forum, videos, and digital tools.

Learning communities and CoPs are strongly highlighted by new tutors as well as conferences & seminars aligning to informal PD literature about PLNs and CoPs (Table5). New tutors of ETA62 and ET63 form CoPs in each course for both administrative, technical, and pedagogical discussions. Building sustainable and active communities remains a wider challenge in the field of PD of the academic staff (Dalziel, 2010; Palloff & Pratt, 1999).

MOOCs on distance education issues are high in PD preferences of new tutors (Table5), though any kind of professional development should be available for tutors at the beginning of the semester or even before. That way tutors will have the time to be aware of peculiarities and to be prepared to respond to students' needs. As for the content of PD processes, tutors need to focus on distance education and pedagogical issues, assessment and reflection, digital platforms.

Regarding staff support, tutors highlighted library support and technical training to a high extend and administrative support to a lower extend since Libraries provide various learning resources and access to numerous data bases (Table 6). They are satisfied but these issues don't seem to bother them much. This should be different, especially as it concerns the library, for tutors that supervise dissertations. Anyhow, it's interesting that new tutors differentiate the concepts of professional development with staff support which mainly is related with administrative, library and technical support to new tutors.

6. Conclusions

Among other, tutors are quality agents and a crucial factor to prevent students' dropout rates and support them to overcome constraints and successfully complete their studies. New tutors in distance tertiary education are experienced learners capable to recognize their professional needs to enhance the quality of their work and fulfill their role successfully.

Due to the specificity of the role and its diversity, the HOU needs to develop a policy of vast training and support for its teaching staff, including theoretical study and practices for new entrants in both teaching and counseling roles.

Key points in a support mechanism for new tutors in an open university are studying collaborative practices and working in learning communities, Coordinators' mentoring role that supports training actions that focus to overcome misconceptions and stable beliefs of the

traditional teaching role, inclusive practices that promote innovation in safe learning environments, quality assessment practices and effective feedback.

A case study is not enough to offer reliable and generalizable conclusions. Research needs to be replicated with larger samples, even with new tutors teaching in other modules or the research could expand to all tutors' needs in an open university and a mechanism for all tutors' support and continuous professional development in open universities.

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Technology Meets Pedagogy: The Role of Staff Support Services in Norway

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Abstract
As efforts to digitalise and innovate higher education have intensified over the last few years, the importance of faculty support for technology-enhanced teaching and learning has become more and more apparent. Little is known, however, about the status, organisation and role of teaching and learning centres and other faculty support units in various national contexts, including Norway. The Norwegian Directorate for Higher Education and Skills, which is the executive agency of the Norwegian Ministry of Education and Research, is dedicated to the enhancement of quality in higher education and skills and is also a driving force for the digital restructuring of Norwegian higher education institutions.
In 2021 the directorate carried out a national survey mapping, among other things, the organisation and make-up of faculty support units, the types of teaching support services on offer, and the roles these structures play in institutional work on digitalisation and quality enhancement.

In this talk we present some of the key findings from the survey, focusing mainly on qualitative data related to lessons learnt from digitalisation efforts the last couple of years, as seen by the support staff, and their perspectives on important priorities going forward. Some of the key insights emerging from our data are that all Norwegian universities and colleges now have institutional structures in place to support technology-enhanced teaching and learning. At the same time, a picture emerges where these support services are organised in many various ways, based on institutional needs. Their foci are also different, from mainly pedagogical and didactic support to mainly software support. At the same time as the manner of organising the support units differ, there is also a call for more national solutions to technical and didactic issues. Finally, there is a need for more research on the teaching staff's needs for support, and how support services can work together with other key institutional and national structures to best facilitate the digital restructuring of Norwegian higher education.

Introduction
Today we will present selected findings from the report "Digital tilstand" 2021, which is a longitudinal survey that has been ongoing since 2008.

Background and earlier research
As stated by many, as i.e Bond et al 2020 p 1: "Digital technology has become a central aspect of higher education, inherently affecting all aspects of the student experience. It has also been linked to an increase in behavioural, affective and cognitive student engagement, the facilitation of which is a central concern of educators" Bond and colleagues mapped

research from 243 studies, mainly within the United States and United Kingdom, between 2007 and 2016. They found that "(…) educators within higher education institutions are encouraged to use text-based tools, knowledge, organisation and sharing tools, and multimodal production tools (….) " (p 24)

 As technology can be disengaging, the educators are also encouraged to ensure that students are trained in the new technologies. Educators also needs to ensure that discussion/blog topics are interesting, that they allow student agency, and they are authentic to students, including the use of social media. Bond and colleagues also found that "[s]ocial networking tools that augment student professional learning networks are particularly useful" (Bond et al 2020 p 24)

In Norway, Raaheim and colleagues investigated digital technologies in exams, in a workshop setting with educators: "The traditional exam has a strong holding within Norwegian higher education and is very often the preferred way of assessing students. Digital technology opens up b for alternatives to the traditional exam, but so far focus has predominantly been on exchanging pen and paper with personal computers within the traditional framework. (…) Lack of knowledge about alternatives to the traditional exam, and lack of knowledge as to how digital technology may be used in assessing students were the kind of challenges most often mentioned." (Raaheim et al 2019 p 219)

From the data collected in the workshop, Raaheim and colleagues found that "[t]he most obvious change as far as assessment is concerned, is the introduction of the digital exam. (…) lack of knowledge about alternative solutions, and lack of digital skills constitute key barriers to change." (Raaheim et al 2019 p 218)

About "Digital tilstand"

"Digital tilstand" is a recurring quantitative, national survey that sheds light on the digital dimension of learning processes and quality development in Norwegian higher education, focussing on academic staff and students' self-assessed digital knowledge and competences. Digital knowledge and competencies in higher education have been a prioritised area for governments and the higher education institutions have built up different kinds of pedagogical support departments. However, in the 2018-version of this study, there was a tendency for academic staff to be unaware of the existence of supportive departments, so we therefore decided to focus on them for the 2021-version of the survey, aimed at selected support environments that have tasks within learning and teaching support and digitalisation. They have an important role in the work with digitization and educational quality at the HE institutions, but which has been little mapped before.

The covid-19 pandemic

From March 2020 universities and colleges in Norway closed their campuses and turned to teaching in digital format. The data collection for "Digital tilstand" started in March 2021, while higher education still had not fully returned to campus-based teaching.

Selection and participation

The institutions have organized their support environments for learning and teaching and digitization in different ways, based on their institutional needs. We therefore invited a

relatively wide selection of support functions, a total of 86 units and environments at 27 institutions. The types of support functions we have invited include

• Learning centres

• HE educational environments/Uniped

• IT services and a selection of digital tools for learning technology

• Multimedia centres

• Library with links to teaching support

• A small selection of administrative environments and resources with tasks that are relevant to the survey

42 managers and 142 invited employees responded to the survey, which was carried out in March 2021. 24 of the 27 invited institutions are represented in the data material, with participation from 1-3 support environments each.

The survey was organised in the following thematic areas:

• organization and composition of support environments

• support environment's work with skills development for professional staff within educational and digital competence

• other roles support environments have in the institutions' work with digitization and educational quality

• experiences from the corona pandemic

• important priorities going forward

Findings

"Digital tilstand" is a quantitative study, but it was important for us to shed light on the perspectives of support environments on the work with digitization at the HE institutions. The questionnaire therefore contained some open questions, and we will present input from two questions: what experiences have support communities made in the work of raising competence during the pandemic, which they think will influence the further work of their support community? And how should the efforts at the institution be prioritized in the coming years so that digitization will contribute to promoting teaching quality?

From the quantitative part of the study, we found that support environments are complicated and complex structures with an interdisciplinary and broad competence profile. The respondents have answered the open questions based on their various academic and professional points of view. The data material nonetheless gives an indication of what the support environments believe is important in the work with digitalization, and what

contributes to educational quality at several levels (e.g., educational management, skills development, educational perspectives, infrastructure, etc.). These are themes and areas that were consistent in the input we received.

When it comes to experiences from the pandemic, many are concerned with the competence of academic staff and the ways in which the increased digital competence can change the further work of the support environments.

1. [Increased competence of specialist staff changes the way support environments work]

Competence in the use of digital technology in teaching has been strengthened. The enforced digitization has also brought with it a positive change in academic staff's attitudes to digitization.

This has led to an increase in the demand for support environments' services. It has, however, to a large extent changed character. The increase in basic digital competence among academic staff has made room for working with more complex issues. It has become possible to focus more on educational and didactic issues. As one of the respondents expressed it: "the guidance focuses more on how to get the teaching good, rather than how to get the technical stuff done."

A shift from "crisis digitalisation" at the beginning of the pandemic to a more systematic and comprehensive educational development later in the pandemic has been recorded. Some feel that academics have increasingly started to invite them in to look more holistically at the design of subjects and study programmes.

2. [The position of support communities is strengthened]

Several respondents see that the position of the support environment at the institution has been strengthened (although only a few mention that the support unit has been given more resources). There is also a feeling that the support environments to a greater extent are regarded as sparring partners in the exploration of learning technology than before the pandemic.

 3. [Examples of development of support environments' offers]

Respondents highlighted specific areas and competence-enhancing measures that have been developed or further developed during the pandemic.

• they have good experiences with digital training and guidance during the pandemic, and the potential these provide to meet a growing need for teaching support "when the need arises". Many respondents estimate a fairly large degree of digitization in the period after the pandemic.

• they have developed the course portfolio (e.g., online "course for professional staff in digital pedagogical skills development").

• it has been difficult to gather specialist staff for joint training, and therefore they have invested more heavily in asynchronous training resources on the institution's websites, and individual guidance.

• sharing of experience-workshops have taken on a more important role during the pandemic. Hopefully, this development will continue in the post-pandemic period as well.

4. [Reflections on the development of the support environment's services going forward]

• A topic that several respondents are concerned with is the need to develop subject-related courses closely linked to the teaching practice of academic staff. Several point out that general training does not reach the teaching staff, and that competence enhancement is best achieved when it is based on their field of expertise and concrete challenges faced by those who are teachers. In this context, several emphasize the importance of individual guidance or counselling.

• There is a need to more closely link the use of technology to educational principles in the courses for professional staff.

• The support environment is dependent on working on a network basis in order to be able to meet the range of professional environments' needs. As one of the respondents writes: "The range of what professional communities need help with is enormous, and we cannot base ourselves on knowing everything ourselves, or having to hire all the expertise in one place."

• And last, but not least: although many are positive about digital skills development, some respondents emphasize the important role of physical meetings, learning communities and relationships have for skills development, especially when it comes to being able to succeed in arranging the support.

In summary, we can see that the corona pandemic has given the institutions and support environments a boost for further work with digitalisation.

Important priorities at institutional level

From the open questions we also identified the 5 themes the support environments think is most important to prioritize at the institution in the future for digitization to contribute to promoting educational quality,

1. Digitization as "a business-critical investment"
One of the themes that recurred in many of the submissions is the need to increase investment in digitization and the importance of anchoring and management at several levels.

Another important point that many have pointed to is the importance of the framework for the work of professional staff, both in terms of raising competence and developing teaching: "That subject staff have resources and are allocated time in their work plans to work on developing their own digital teaching skills and the teaching itself."

2. Competence enhancement within educational and digital competence

Furthermore, many people point to the need to continue investing in skills development. One of the important points highlighted is the need to work more comprehensively and strategically including developing flexible trainings for academic staff and to work closely with their needs and teaching practices.

3. Pedagogical development going forward

There is increased need for investments in educational development work and research on teaching and digitalisation.

Among other areas of development that the informants highlight are:

• the need to focus on flexible education and ensure the quality of these

• the importance of learning design

• the need to work more holistically with teaching, beyond individual subjects

• the need to focus on student active learning, including the activation of students on digital surfaces.

• Several highlight the need to have more focus on coordinated teaching, and to develop new assessment practices, both about formative and summative forms of assessment.

• And the need to work more with the learning environment, especially in digital and flexible educational services

4. Infrastructure and technological perspectives

Several informants point to the need to invest more in digital infrastructure and the acquisition of digital tools, and to focus on physical infrastructure, as teaching rooms are adapted to more hybrid and dynamic forms of learning. More work should be done on the technical quality of teaching materials. The need to invest in better equipment is mentioned in this context, as is effective management and administration of learning technology. Collaboration on the development of digital learning material and more sharing, i.a. in that the learning platforms are opened to a greater extent for sharing across institutions.

5. Strengthening of support functions

Several believe that there is a need to strengthen the support functions. Many express that the digital competence among specialist employees has increased because of the pandemic. The support environments feel that academic staff have become more interested in developing their teaching practice. This increases the demand for services from the support communities. In addition, the support environments expect increased project activities related to digitization and educational innovation.

Conclusion

In summary, we see that during the pandemic the support environments have experienced increased demand and met new needs by developing new competence-enhancing training and scaling up existing programs. The pandemic has shown that support environments are flexible entities that can adapt quickly when external circumstances require it. This shows that they have the potential to be very useful in the further work on digital transformation at the institutions.

We have presented the main features of our qualitative material about what support environments think is important in the work with digitization and educational quality at the

institutions. But there is a need for more research into the types of support the academic staff need in their role as teachers, and how to organize the support so that it best meets the institutions' needs.

Notes
Korona: There are 25 (out of 42) managers and 61 (out of 142) employees who have answered the question.
Priorities: There are 27 managers and 96 employees who have answered the question.

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Direktoratet for høyere utdanning og kompetanse (2021): Digital tilstand 2021: Støttemiljøers arbeid med digitalisering og utdanningskvalitet ved universiteter og høyskoler. Report 6/2021 http: Digital tilstand 2021 Støttemiljøers arbeid med digitalisering og utdanningskvalitet ved universiteter og høyskoler (hkdir.no)

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Open education and MOOCs, European MOOC Consortium

Collaborative learning in MOOC forums – a collective case study of an American and a French version of a massive open online course

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Abstract (Calibri, 12 pt, bold)

While many MOOCs are considered to be a tool for individual learning where learner's forums tend to be exchanges of one question-answer without interactions, some MOOCs are far more collaborative, with mentors and tutors encouraging participation and creating bonds within the learner's forums (Liyanagunawardena et al., 2019).

A well-structured course design with collaborative or cooperative activities is certainly engaging but it does not necessarily guarantee learner's participation and/or collaboration since the learner's diligence is under uncertainty (Estrada-Molina & Fuentes-Cancell, 2022). Given the large number of participants and considering that learners are permitted to transfer their unfinished course progress in a future session, switch courses or just abandon anytime, collaborative groups are difficult to form and maintained in MOOCs. However, collaborative learning may also depend on the cultural context in which the MOOC takes place.

In the present study, we use a collective case study method (Goddard, 2010) to analyze two different versions of the same MOOC. The first one is the 2019 version of HarvardX's "Leaders of Learning", presented for several years on the edX platform. The second one is a French version of the same MOOC, with the same content, presented during one session in 2019, by FUN Université Numérique platform as "Leaders of Learning: Les pilotes du Changement". A combination of qualitative and quantitative data collection methods was used. First, we counted the number of messages by forum type. Then, we analyzed the forum's messages to compare the exchanges, interactions, and collaboration among learners and between learners and mentors/tutors of the two MOOCs. Following Dillenbourg et al. (1999) and Henri and Lundgren-Cayrol (2001), we initially defined collaboration as an active attempt from two or more people to learn or try to learn something together.

Preliminary results suggest that participation varies in the two MOOCs, according to the type of forum and the time period. In the French version, we have found an increased number of message exchanges, starting with the presentation forum, where members of the pedagogical group were actively answering every message. On the contrary, in the American version, we have noticed many messages without an answer.

It seems that with active and regular tutoring and mentoring, exchanges and interactions among learners are facilitated and developed, while the reluctance, defect, or absence of mentoring and/or tutoring leads to forums that function in a question-answer mode, leading to a more individual learning activity.

Mentors and tutors are key persons to stimulate interaction between learners while simple question-answering activities do not necessarily contribute to collaborative learning.

Complete results will be presented at the conference. Further analyses will characterize the relationship between learners' exchanges and interactions towards collaboration, as well as the extent to which collaboration promotes learning in both MOOCs.

Keywords: MOOC, collaborative online learning, interaction, discussion forums

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The OPENLang MOOC for Language teachers: "Exploring how to (re)use Language Open Educational Resources (OERs)"

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Abstract

Nowadays the need for openly accessible and free educational material is highly imperative more than ever before especially because of the outbreak of the COVID-19 pandemic. Designing a Massive Open Online Course (MOOC) for training language teachers on the use of Open Educational Resources (OER) is a quite challenging task. In the framework of the "OPENLang Network" Erasmus+ project (https://www.openlangnet.eu/), it was developed a 4-week MOOC which aims at guiding participants through the discovery, (re)use, creation, and sharing of multilingual and interactive Language OERs for teaching purposes in language education. This training course has run during November 2021 and it has been delivered via the OPENLang Network platform, an open and collaborative Moodle-based environment, which was developed in the context of the same project. The MOOC was addressed to language teachers, trainers, and learners who wished to explore the (re) use, creation, and sharing of Language OER. The MOOC is still openly accessible to everyone here https://openlang-network.kmi.open.ac.uk/ and can be also downloaded as an OER.

This paper aims at presenting the methodology behind the design, development, and evaluation process of the OPENLang MOOC entitled: "Exploring how to (re)use Language Open Educational Resources (OERs)". It will also analyse and discuss its content, its pedagogical framework, and the feedback received by its first internal pilot. Finally, the paper will conclude with the major lessons learned and the future aims of this research.

Keywords: OER, oer competences, MOOC, open education, open educational resources, teachers' competence, teachers' digital competence, teachers' digital skills, teachers' professional development

1. Introduction

In the age of digitalization and of continuous technological progress, opening up education and offering opportunities for open online language teachers' training courses is imperative more than ever before, especially during the covid-19 era. During this difficult period, all language teachers were obliged to deliver their courses online and to use online material even though most of them were not prepared for this at all. The need for openly accessible and free educational material started to grow really fast. One of the most important teachers' training needs was and continues to be the efficient use of Open Educational Resources (OERs). According to UNESCO (2002), OERs are defined as 'technology-enabled, open provision of educational resources for consultation, use, and adaptation by a community of users for non-commercial purposes. They are typically made freely available over the Web or the Internet. Their principal use is by teachers and educational institutions to support course development, but they can also be used directly by students". OERs include learning content and software tools for development, as well as use, and distribution of content (OECD, 2007). More specifically, the OER types include a wide range of educational materials such as courses, curriculums, syllabus, lesson plans, modules of courses, educational content (e.g., text, multimedia), data, softwares, tools, games, case studies, portfolios, mind maps, books, teaching scenarios, assessment activities (e.g., quizzes, projects, exams), certificates and more (Economides & Perifanou, 2018).

OERs often have a Creative Commons or General Public License (GNU) that describes specifically how the material may be used, reused, or adapted by other users. Language teachers' knowledge on how to discover openly accessible educational resources, how to use them, how to create their own teaching material, as well as where and how to share them is still low. The "5R Framework" (Wiley, 2014; 2021) outlines what teachers can do with OERs:

- Retain: Users have the right to make, archive, and "own" copies of the resource;
- Reuse: Users have the right to reuse the resource in its unaltered original format;
- Revise: Users have the right to adapt, adjust, modify or alter (e.g., translated into another language) the resource;
- Remix: Users have the right to combine the original or revised resource with other resources to create something new;
- Redistribute: Users have the right to share copies of the resource with others in its original, revised or remixed format.

As aforementioned, the need for OER has been increased due to the school closure as a result of the covid-19 pandemic. Usually, traditional publishers do not provide schools and students their books in digital format fearing illegal copying. So, teachers and students had not access to their usual educational material. OER can help in overcoming this problem. Other obstacles that OER could help students overcome are the financial burden that they face during their studies because they (or their parents) cannot buy textbooks due to their high cost (Donaldson et al., 2018; Fischer et al., 2020; Jenkins et al., 2020). In fact, by using OER students can save money (Hilton, 2016) and have equal opportunities for education (UNESCO, 2019). In addition, many teachers can have not only a larger variety of educational material to select for their teaching (UNESCO, 2019) but also the possibility to adapt the OER of their choice to their specific educational context and their students' needs, experiences, and knowledge (e.g., Blomgren, 2018; Kimmons, 2015).

Literature (Kosmas et al., 2021; Perifanou & Economides, 2021a; Luo et al., 2020; Berti, 2018; Mishra & Singh, 2017; Guo et al., 2015) shows that unfortunately teachers usually lack knowledge and skills with regard to OER. Although during the last decade there have been many initiatives towards the promotion of the use of OER in school and HE teachers by important organisations (e.g., OECD, UNESCO), there is still a lot of work to be done. For example UNESCO (2019) recommended actions for teachers' capacity building on using, re-using, adapting, and sharing OER, but most educational institutes still do not offer training programmes to teachers on OER and do not promote their use by rewarding teachers for using OER in their teaching [Hassall & Lewis, 2017; Wang & Towey, 2017; Jhangiani et al., 2016). In fact, it is urgent more than ever before to train in-service and pre-service teachers on accessing, using, adapting, creating, and sharing OERs into their teaching practice (OECD, 2020; UNESCO, 2019).

Taking under consideration the need for teachers' training on OER, a group of researchers and language teachers designed, developed, and tested a 4-week MOOC which aims at guiding attendants through the discovery, (re)use, creation, and sharing of multilingual and interactive Language OERs for teaching purposes in language education in the context of the "OPENLang Network" Erasmus+ project (https://www.openlangnet.eu/). This training course has run during November 2021 and it has been delivered via the OPENLang Network platform, an open and collaborative Moodle-based environment, which was developed in the context of the same project. The MOOC was addressed to language teachers, trainers, and learners who wished to explore the (re) use, creation, and sharing of Language OER. The MOOC is still openly accessible to everyone (https://openlang-network.kmi.open.ac.uk/) and can be also downloaded as an OER (e-book: EPUB format). In the following sections this paper will present and analyse the methodology behind the design of the OPENLang training MOOC as well as its development and evaluation process.

2. Previous Studies on MOOC Design

Designing a Massive Open Online Course is a big challenge as this implies taking under consideration not only pedagogical issues, but also other issues such as technological, logistical, or financial ones (Perifanou, 2020). Even though the initial first generation of cMOOCs supported a connectivist theory of learning and the second generation of xMOOCs focused more on 'knowledge duplication' and on a more traditional classroom structure (Siemens, 2014) in the last years the design of MOOCs is evolving with all kinds of variations (Bates, 2015). Though literature review on previous studies on MOOC design has shown that there are several research papers that propose specific strategies to MOOC instructors for designing their MOOCs (e.g., Bonk et al., 2018; Chew et al., ,2017; Perifanou, 2016a; Wong 2016; Drake et al., 2015; King et al. 2014; Khalil & Ebner, 2013, Siemens 2012a;) but there is still a low number of studies that explore or propose specific designing models for MOOCs (Guàrdia et al., 2013; McAndrew, 2013; Siemens, 2012b), or training/Continuous Professional Development (CPD) MOOCs (Naidu et al., 2018).

An interesting study (Lee et al., 2016) proposed a MOOC design model that could improve the current practice of MOOC development in Korea by specifying easy-to-use course development procedures and guiding strategies. This model included 6 procedural phases and 9 specific steps. The six procedural phases are: Analysis (1st Iteration), Design, Development (Course Development), Implementation, Evaluation, and Analysis (2nd Iteration). Furthermore, a recent study (Naidu et al., 2018) proposed an interesting concept map that illustrates the conceptualization of the CPD MOOCs as well as a set of Design strategies for the CPD MOOCs that are in line with guiding principles for e-teaching.

3. Methodology

The methodology adopted in order to design the OPENLang MOOC was based and grounded on both the "Design-based research" (DBR) approach and the "Action Research" (AR) approach. The "Design-based research" (DBR) approach is a methodology designed by and for educators that seeks to increase the impact, transfer, and translation of education research into improved practice (Anderson & Shattuck, 2012). The DBR approach is a systematic and flexible methodology that incorporates both evaluation and empirical analyses and it is often used with technological interventions. According to Reeves (2006) this methodology aims at improving educational practices through an iterative process of four (4) phases that include:

a) *analysis:* analysis of existing levels of practices by researchers and practitioners;
b) *design:* designing, developing and implementing solutions as appropriate;
c) *development:* testing and refining solutions in practice;
d) *implementation:* reflection by researchers and practitioners on authentic problems to produce design principles and enhance solution implementation

Similarly, the "Action Research" (AR) approach involves a systematic process of examining the evidence. The results of this type of research are practical, relevant, and can inform theory. "Action research" is different than other forms of research as there is less concern for universality of findings, and more value is placed on the relevance of the findings to the researcher and the local collaborators (Riel, 2020). It includes a four stages procedure with 9 specific steps:
a) *The planning stage* -> 1. Identify and limit the topic; 2. Gather information; 3. Review the related literature, 4. Develop a research plan;
b) *The acting stage* -> 5. Implement the plan and collect the data; 6. Analyze the data;
c*) The developing stage* -> 7. Develop an action plan;
d) *The reflecting stage* -> 8. Share and communicate the results; & 9. Reflect on the research process.

Based on the above DBR & AR approaches the University of Macedonia (UoM) team has proposed the OPENLang MOOC design process that includes three (3) main phases and 6 specific steps (Figure 1):
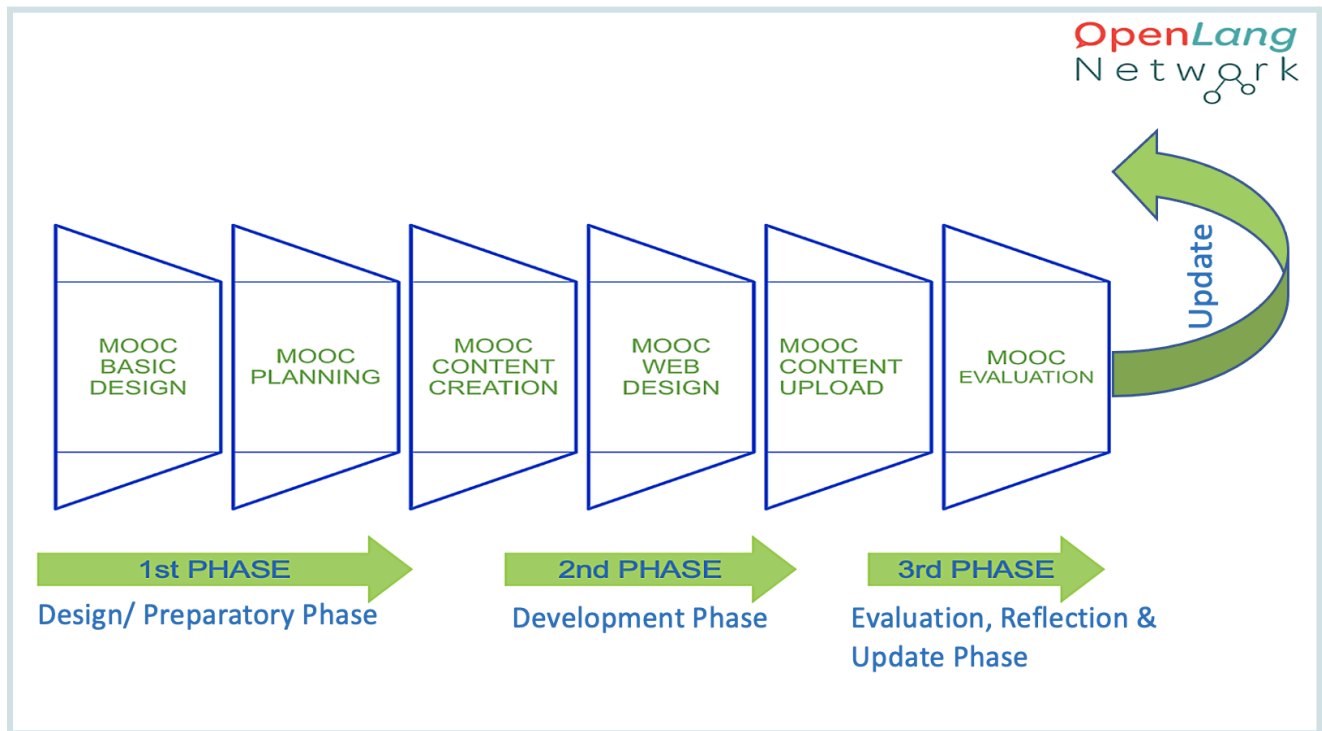
Figure 1: The OPENLang MOOC design, development and evaluation process.

a) *Design/ Preparatory Phase* (1) -> MOOC Basic design, content planning and platform selection;
b) *Development Phase* (2) -> MOOC Content development, web design and content upload;
c) *Evaluation Phase* (3) -> MOOC Evaluation, Reflection and Update.

These three phases include information about the rationale behind the selection of the MOOC platform, the process of organising, controlling and uploading the content, as well as the evaluation of the MOOC by all partners. In the following section, all the phases that led to the design, development, and evaluation of the OPENLang MOOC will be analysed thoroughly.

4. The OPENLang MOOC Design: Phase 1

In this section, it will be presented and analysed in a more detailed way the design of the OPENLang training MOOC. First, it is outlined the rationale behind the design and the planning of the MOOC and next are analysed the reasons for the selection of the specific MOOC platform.

4.1 Theoretical Rationale and MOOC design components

The theoretical rationale behind the design of the MOOC is strictly connected to the rationale behind the design of the OPENLang Network platform which is based on the "OPENLang Network's Pedagogical Framework" (Perifanou & Economides, 2021b). The MOOC is one of the basic services of the OPENLang Network platform and envisages to offer a highly interactive and collaborative open language learning environment where learners will be placed at the centre of the learning process and they will be free to choose their learning path. They can study at their own pace and any time they wish either autonomously or in collaboration (Perifanou & Economides, 2021b).

The philosophy behind the design of the OPENLang Network's Pedagogical Framework was inspired by a learner-centred and social-constructivist & connectivism pedagogical paradigm blending a variety of pedagogical approaches and instructional strategies derived from the areas of CALL, e-learning, SLA and FLL. It is also worth mentioning that the creation of the OPENLang Network Design Framework has been strongly

inspired by the Theory-Based Design Framework (Dubbagh, 2005), the Framework for Sociability and Usability (Preece, 2001) and the Massive Open Interactive Language Learning Environment (MOILLE) Framework (Perifanou, 2016a).

As regards to the design of the MOOC on Language OERs, the MOILLE framework (Perifanou, 2016a) offers useful guidance for its design. More specifically, the MOILLE framework proposes a set of six (6) different design dimensions that should be considered carefully one by one before the design of an online learning environment of massive scale: a) Content; b) Assessment; c) Pedagogy; d) Community; e) Technical; f) Infrastructure; g) Financial issues. Even though this framework was created in order to guide instructional designers, language teachers or developers who have interest in designing or evaluating a successful online Language Learning environment that has a massive character, it has also inspired the design of the OPENLang training MOOC for language OERs (Figure 2).
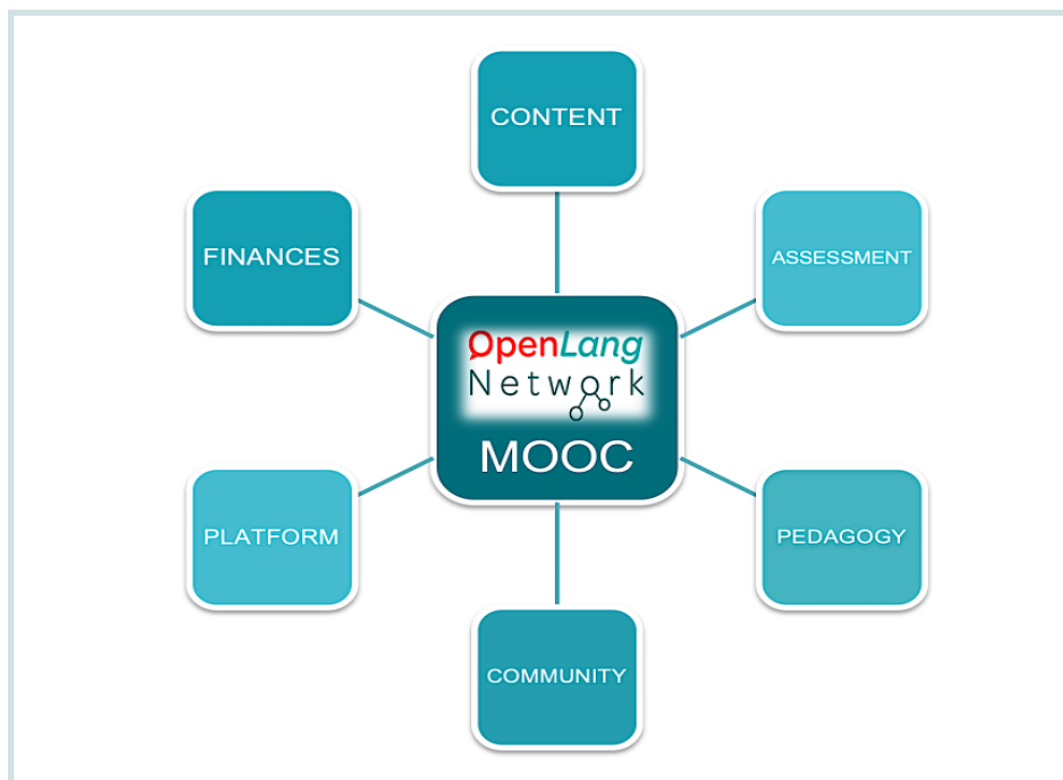
Figure 2: The OPENLang MOOC design components
(Perifanou & Economides, 2021b).

More concretely, we have considered the following design components:

a) *Content:* The content of the MOOC is collected carefully and is a result of a thorough literature review and desktop research. The main thematic topics are in line with those presented in the OPENLang OER e-toolkit for language teachers and trainers (Kosmas et al., 2020) but the main content is widely enriched with supplementary content such as online articles, handbooks, videos, infographics, images, games (quiz-kahoot), and more. It also offers many more practical examples, and many more hands-on and self reflection activities, self evaluation quizzes, and other activities which are open to peer feedback. In many learning activities learners are invited to share their work in the MOOC's discussion forum, but also in the OPENLang Network's "Language OER database" which are open for evaluation by all members of the OPENLang Network's community, either language teachers or

learners. The content has been carefully selected in order to have good quality and nice design, to be recent and easily comprehensible by every user, as well as interactive. What is unique in the content of this course is the focus on language OERs. Our research has shown that there is no other MOOC that focuses on Language OERs and for that reason this task was also very challenging. Most related MOOCs focus mostly on the basic steps needed in order to create an OER, but not a language OER. This is why we have included in our MOOC useful resources for the discovery, use, creation and sharing of language OERs. The content produced is openly accessible, can be downloaded as an ebook and can be used freely as an OER.

b) *Assessment:* The assessment of the OPENLang MOOC's participants includes a blend of assessment modes that combines self-evaluation and peer to peer evaluation. According to literature (Falchikov & Goldfinch, 2000), self-evaluation and peer-assessment can help learners develop their ability to make judgements about their own performance. That means that learners become autonomous, independent and self-regulated learners and are more responsible when they are involved in their own learning. Self and peer assessment can improve the quality of learning because they can help learners to critically analyse their own work or the work done by others rather than simply see a mark and can provide them an opportunity to gain a wider range of feedback. Learners can also develop transferable skills, such as communication, analysis and argument (Brown, 1999); Ross, J, 2006). More specifically, in the context of the OPENLang MOOC each participant is invited to take a final quiz at the end of each week that provides him/her instant feedback. In the OPENLang MOOC, other activities that also promote self-evaluation are the self-reflection activities, while the "forum activities" promote peer assessment.

Furthermore, the use of badges is included in the evaluation process because according to literature their use has also been investigated as an efficient way to motivate learners' participation especially in MOOCs. In fact, gamification of learning and generally gaming features can be highly motivational in the learning process and are common in web 2.0 communities. In our case each MOOC participant can earn a badge when he/she is reaching certain milestones such as when finishing the reading and activities of a week of the MOOC, or when uploading a language OER that is also one of the recommended MOOC activities. Data mining and Learning Analytics tools that can monitor the learning process are included also in the OPENLang MOOC in order to evaluate learners' participation and help us improve the design of the MOOC and/or its content.

c) *Pedagogy:* The design and implementation of the language teacher's professional development MOOC on language OERs is largely in line with the pedagogical philosophy of the development of the OPENLang Network design framework which is based on a learner-centred and social-constructivist & connectivism pedagogical paradigm blending a variety of pedagogical approaches. Active communication and continuous interaction between all participants (peer-peer, student-teacher, open community) are promoted as well as collaboration (social constructivism), networking and collective intelligence (connectivism). Additionally, autonomous, self-paced, self-regulated learning and self-reflection are also highly promoted. Lastly, a gamified learning process has been also emphasised. As aforementioned, a gamification approach has been adopted and users of the platform's services can be awarded badges when they reach certain milestones, e.g., when they complete the study of a week of the MOOC, or when they upload a language OER that is also one of the recommended MOOC activities.

In total, we could say that the OPENLang MOOC combines features of cMOOCs and xMOOCs that promote teachers' learning through active engagement, peer interaction, mutual support, autonomous learning, creation and sharing of artefacts as well as "drill and practice" exercises. According to Siemens (2012b) "cMOOC model emphasises creation, creativity, autonomy and social networking learning" and "focus on knowledge creation and generation" whereas the xMOOC model emphasises "a more traditional learning approach through video presentations and short quizzes and

testing and focus on knowledge duplication". xMOOCs have another educational philosophy that focuses more on the transmission of knowledge and what educators might term "drill and practice" (Hollands, & Tirthali, 2014). They are based on the cognitive-behaviourist pedagogy and support a tutor-centric model that establishes one-to-many relationship to reach massive numbers category (Bárcena, et.al, 2014).

d) *Community:* One of the major design aspects of this MOOC is that it is hosted on a *Moodle* platform that supports networking and the creation of a community of practice. This is possible because *Moodle* platform offers a big variety of tools/services that could widely promote community building (e.g., discussion forum, announcement forum, participants searchable database, private messages, personal blog posts, community forum).

e) *Technical Infrastructure-Platform: Moodle* platform is maintained by the Open University of UK.

f) *Financial issues:* Free for users. The platform's maintenance costs are covered by the OPENLang Network project and voluntary work.

4.2 **MOOC Planning**

The following table briefly presents the basic info of the planning of the OPENLang Training MOOC.

Table 1: The OPENLang MOOC planning

MOOC planning	
Title	"OpenLang MOOC: Exploring how to (re)use Language Open Educational Resources (OERs)"
Main Topic	Discovery, (re) use, creation, sharing and of multilingual and interactive Language Open Educational Resources (OER).
Additional Learning Objectives	- Practice/ development of Language skills, digital skills, collaborative skills; - Exploring and understanding the open education movement/ philosophy.
Proficiency Level	Basic
Target group	Language teachers, language learners, anyone that has interest in exploring the use of Language OERs.
Duration	4 weeks
Mode of delivery	Online
Technical Infrastructure	Moodle platform
Type of MOOC	Combination of cMOOC & xMOOC
Type of content	Interactive multimedia: quizzes, ebooks, animated infographics, video, etc.
Type of Activities	Multiple choice, game based (Kahoot), self- reflection, task based activities
Number of Activities	Maximum 10

Content Structure	6 Modules (2+2+1+1 per week)
Workload	6-8 hours per week
Type of Assessment	Self assessment, peer-to-peer assessment; Formative: self-reflection activities, game quizzes (Kahoot) Summative: Final weekly quiz with automated feedback (up to 5 times to complete it).
Awards/Certification	Weekly badges and Certificate of participation.

4.3 Selection of the OPENLang MOOC platform

In the following paragraphs are presented the criteria that we have established for the selection of a suitable MOOC platform. These criteria are driven from the "OPENLang Network Pedagogical and Design Framework IO2" (Perifanou & Economides, 2021b) that focus on the creation of a highly interactive and collaborative learning environment that promotes community building, networking, peer feedback, collaboration, as well as from autonomous learning, self evaluation, and self reflection. The user-friendly interface and the appealing presentation of the content were also important. To that end, we have done research exploring, selecting and finally evaluating various open-source platforms such as *Moodle, Sakai, Canvas, Blackboard*. Findings have shown that there are several LMS options which are available, both proprietary and free ones, but we have selected *Moodle* as it fulfils the following criteria that are basic features for the OPENLang platform and the MOOC:

- Openness: *Moodle* is completely free and open source.
- Customisation: *Moodle* supports custom plugins to extend its codebase.
- Interoperability: *Moodle* supports the most widely used standard specifications for educational data, including SCORM and xAPI.
- Mobile interface: *Moodle* offers a dedicated app for mobile devices and supports the development of responsive interfaces.
- Community support: *Moodle* has a vast community supporting it, currently consisting of more than 800 developers.
- Monitoring: *Moodle* allows students to monitor their progress when studying a course. *Moodle* also offers detailed reports to teachers about the progress of their students.
- Storytelling: *Moodle* supports storytelling via its tools for course authoring and via third-party plugins.
- Interactivity: *Moodle* offers various tools for facilitating interactivity, such as discussion forums, private messaging, live chats, and more.
- Gamification: *Moodle* supports gamification via tools such as badges and also via third-party plugins.

Our research findings also confirmed the literature that supports that *Moodle* is a very good and low-cost platform for the creation and delivery of MOOCs or Language MOOCs (Mackness, et al. 2013; Cooch, et al. 2014; Perifanou, 2016; Perifanou, 2021). *Moodle* platform is a very popular platform and its success is growing rapidly. Currently, there are more than 178,000 *Moodle* sites offering 40,000,000 courses to 308,000,000 users in 273 countries worldwide making it the world's most widely used learning platform.

5. Phase II: MOOC Content Development

In this section, are described the thematic topics of the OPENLang MOOC. It is also presented the process of how we collected all the resources, how we developed the final content of the MOOC, and how we have organised and structured its modules.

5.1 OPENLang MOOC Modules

The OPENLang MOOC is entitled: "Exploring how to (re)use Language Open Educational Resources (OERs)". The MOOC content is organised in 6 modules to be delivered in the course of 4 weeks and the expected study time per week is estimated at 6-8 study hours. The thematic topics that the MOOC covers are the same with those in the "OPENLang Toolkit for Language OER". More specifically, the 6 MOOC thematic Modules and their contents are the following (Table 2):

Table 2: The OPENLang MOOC on Language OERs Modules

OPENLang MOOC on Language OERs MODULES
Week 1
Module 1: Introduction To OER and OEP 1.1   Defining OER 1.2   Defining OEP 1.3   Categories and Characteristics of OERs 1.4   Benefits of using Language OERs 1.5   Challenges in using Language OERs
Module 2: An Overview of Existing OER Guidelines Week 1 Quiz: Test your Knowledge
Week 2
Module 3: Discovering a Language OER 3.1   Search Tips 3.2   Language OER Repositories
Module 4: Evaluating a Language OER 4.1   Why is it Important to evaluate a Language OER? 4.2   How can I evaluate a Language OER? 4.3   Extra OER Evaluation Tools Week 2 Quiz: Test your Knowledge
Week 3

Module 5: Using, Creating And Sharing A Language OER

5.1   Using A Language OER

5.2   Creating An OER For Language Learning

5.3   Sharing Your OERFor Language Learning

Week 3 Quiz: Test your Knowledge

Week 4

Module 6: Copyright and Open Licensing

6.1   What is Copyright?

6.2   What is a Creative Commons License?

6.3   Choosing a License

Week 4 Quiz: Test your Knowledge

By enrolling in this MOOC, participants have the opportunity to learn about the main characteristics and benefits of using language OERs as well as the main challenges of introducing OERs in language education. The course also introduces efficient approaches for searching, discovering, and evaluating a language OER. What is highly interesting is that participants learn how to build upon an openly licensed digital material and share its updated version. Last but not least, by the end of this course participants understand the importance of Copyright and Open Licensing and learn what CC licences are, how to use them correctly and how Open Attribution tools can automatically generate CC licences for the OER that participants create or wish to use and attribute its owner.

5.2   OPENLang MOOC Content Organisation and Types of Content

The MOOC content was organised carefully and the different types of content (images, videos, text, online resources) were collected in different Google drive folders. The effort to collect all the information needed took a lot of time because we searched for open and updated content of high quality. We have also produced our own introductory videos and created our own images using open content. For the creation of the content we have used as a base the content of the OPENLang Toolkit on Language OERs, which offers a complete step by step guideline containing all the core elements for the discovery, use, creation, and sharing of quality multilingual and interactive OERs for Language education. The material of the OPENLang MOOC was enriched with more authentic and interactive content (e.g., videos, games, more resources and more activities of various types like quizzes, self reflection activities, task based activities, forum activities, and more). We have also selected and edited a number of images/logos that could facilitate our work to organise the content, but also to help learners in understanding the type of information in the MOOC during their learning process (Fig. 3)
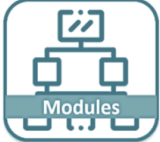
Figure 3: Images/logos used for the organisation and explanation
of the OPENLang MOOC content.

The MOOC content was created and organised by the team of the University of Macedonia (GR) and was uploaded on the MOOC platform by the team of the Open University of UK that was in charge of the development and technical support of the platform. With regards to the multimedia material produced by the OPENLang Network consortium, we have created a YouTube channel (https://www.youtube.com/channel/UCTh_vc5kZHggbvsHzlLMCBg) on which we have uploaded all our videos and organised them in different playlists based on their content.

5.3   **Phase II: Web design and content upload on the MOOC platform**

In this section will be described the design of the MOOC platform and how the content was uploaded from Google Drive to the MOOC platform. Each week offers one or more different modules that include a set of activities, various resources, and a final quiz. Figure 4 shows a snapshot from the "home page" of the OPENLang MOOC and its introductory materials, featuring a promotional video, a short description of the MOOC, as well as links to the Announcements and Discussion forums of the course.
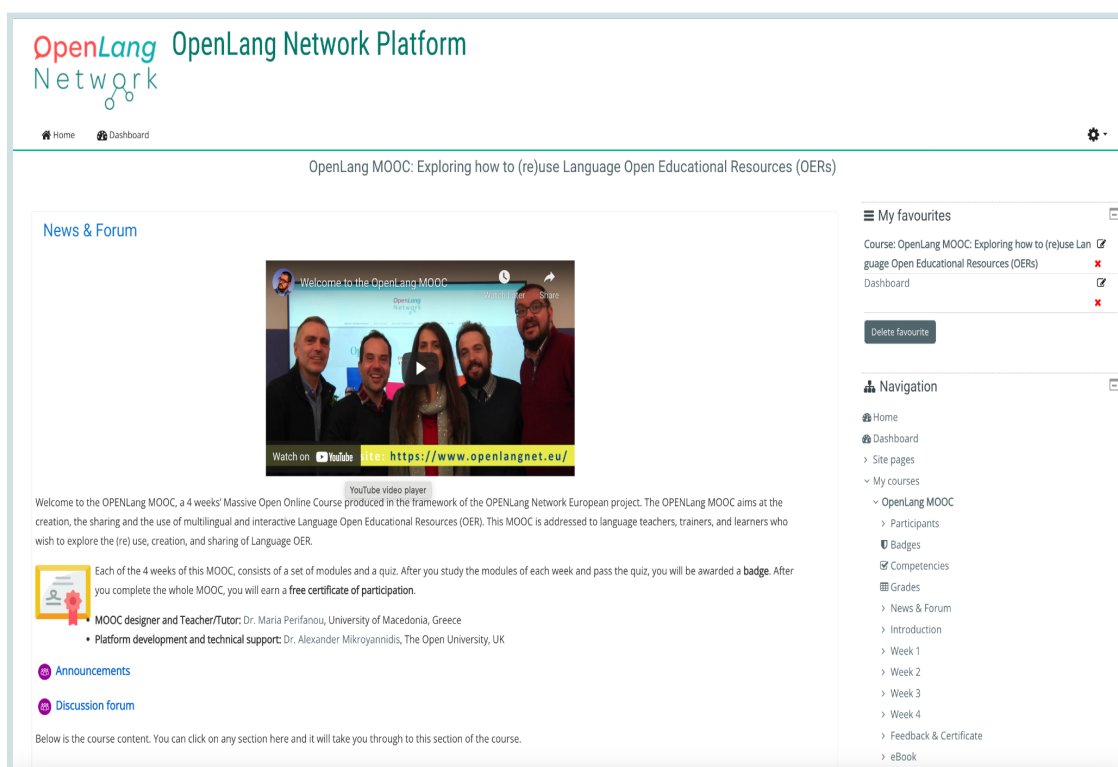
Figure 4: Snapshot from the introductory materials of the OPENLang MOOC.

In the same webpage it is also included the content that can be easily navigated using the sidebar on the right. The six modules are distributed accordingly in each week based on their thematic topics and their quantity. During the first week participants are invited to study Module 1 and 2 while in the second week the study material includes again two modules, Module 3 and 4. In the course of the third and fourth week participants focus on the study of only one module, Module 5 and 6 respectively. It should be mentioned that several learning activities within the modules of the OPENLang MOOC invite the learners to use the other e-services of the "OPENLang Network platform". For example MOOC participants are invited to create, evaluate and share language OER using the "Suggest & Share a language OER" service, explore the language OERs proposed at the "Recommended Language OERs" section and post useful educational material or useful info at the "Community platform". The MOOC offers many community features that really promote community building and networking. Besides the forums, learners can post their thoughts using their personal blog or add comments to any other MOOC learner's blog. Learners can also use the database of MOOC participants to find other members to add as friends and contact or chat with them if they wish. Many of these community features are used for the MOOC activities. After MOOC participants complete the study of the modules of each of the 4 weeks and pass the final quiz, they are awarded one badge per week. Upon completion of the whole MOOC, participants can earn a free certificate of participation that is auto-generated by the platform. The certificate of participation includes a QR code, which can be scanned to verify the validity of the certificate.

6. Evaluation by the partners: Phase III

Upon completion of the first version of the OPENLang MOOC all project's partners and staff members from all organisations in the form of focus groups tested the OPENLang MOOC with respect to pedagogical and design parameters. They followed all the content, page-by-page, module-by-module, viewed the videos, took the quizzes, explored the suggested OERs, and more. They checked the ease of navigation, the workload per

module and per week, the level of difficulty and details, the colours, the size of fonts, pictures, tables, and more. Then, they made suggestions to the designer and tutor of the OPENLang MOOC. After discussions, reflections, and revisions, the OPENLang MOOC was ready for launching to the public.

7. Conclusions

Designing a training MOOC for equipping language teachers with knowledge and skills to discover, use, and manage existing OERs as well as to develop new ones is a big and important challenge. Despite the difficulties that the OPENLang team faced, they have successfully developed the "OPENLang MOOC on Language OER" that is now offered for free to all language teachers and learners worldwide. The main aim of the team is to invite all language teachers and learners to start exploring, finding, and using language OER efficiently and why not also share their own teaching and learning resources. It is not easy to find language OER as they are scattered all over the places despite the various efforts made so far by major organizations such as MERLOT and OER Commons. The OPENLang team offers not only a training MOOC on language OER, but also a rich database with evaluated language OER that is open to anyone for use and contributions. The major lessons learnt are that designing a training MOOC needs a big effort and attention not only for the selection of its pedagogy and its content, but also for other issues such as technological, logistical, promotional, or financial ones. The process of finding, organising, controlling, and uploading the content is time consuming and the cost for this work and for the platform can be high. Despite the various difficulties, a training MOOC of good quality can help millions of teachers across the world to start using OER and understanding the big value of sharing their own OER with the wider teaching community embracing in this way the "Open Education Movement" that gears towards open and free education. This paper also aimed at proposing a training MOOC design process that could help more researchers and teachers design their own training MOOCs. Further results of the OPENLang MOOC pilots will be published soon in upcoming publications.

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Upskilling STE(A)M educators with the STEAMonEdu MOOC

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Abstract

This paper presents the design, development, and implementation of a Massive Open Online Course (MOOC) for the professional development of educators in STEAM education. The design of the MOOC was based on the STEAM Competence Framework for educators (STEAMCompEdu) and is part of STEAMonEdu project that nominated educators as the pillars of the implementation of STEAM education and aimed to support their professional development.

Keywords: MOOC, STEAM education, STE(A)M education, competence development, teachers' professional development, competence framework

1. Introduction

STE(A)M (Science, Technology, (Arts) and Mathematics) education grew out of STEM education and consists of learning experiences that help students realize how to focus and learn by emphasizing logical, mathematical, experimental, and scientific thinking. At the same time, it increases students' learning motivation by arousing their curiosity about applying scientific and technical learning in real-life situations (Bybee, 2013). The STE(A)M movement builds on existing models of interdisciplinary curriculum. It assists students in exploring content areas by foregrounding a problem or issue using multiple inquiry processes, which naturally connect the disciplines through the problem to be solved (Herro & Quigley, 2017). As opposed to traditional teaching models, educators using the STE(A)M education approach bring the disciplines together. Students can exercise both sides of their brains at once through this holistic approach.

Nevertheless, no STE(A)M education transition will ever be possible without educators' active and total involvement. As teaching strategies change, educators need to update their competence sets to face STE(A)M education challenges (N. Spyropoulou & Kameas, 2020). However, educators' guidance on effectively teaching STE(A)M-related courses are lacking (Margot & Kettler, 2019; Moore et al., 2014; Ng, 2019). That is why it is widely accepted that any STE(A)M education initiative must first invest in upgrading the competences of educators.

As part of the STEAMonEdu Erasmus+ project[1], an innovative competence framework for STE(A)M educators was developed (Kameas & Spyropoulou, 2020). Overall, the framework aims to (N. Spyropoulou & Kameas, 2020) a) assist educators in self-evaluation in order to identify specific STE(A)M education competences that they need to improve and b) support the professional development of STE(A)M educators. Furthermore, based on this framework, a Massive Open Online Course (MOOC) was developed, addressed to educators and managers/directors at all levels of education, which addresses their need to understand, adapt, apply and create modern STE(A)M educational procedures and practices that enhance the effectiveness and acceptance of short- and long-term educational processes.

This paper provides the basic concepts behind MOOC design and development and the rationale behind the training program design and contents. More specifically, the following sections describe the STEAMonEdu approach, and a short description of the methodology and the toolset used by the consortium in developing the training program is also provided. Finally, the first evaluation of the MOOC that took place in 2021 is presented.

2. The STEAMonEdu approach

The overall approach of STEAMonEedu project was to nominate educators as the pillars of the implementation of STE(A)M education and support their professional development. The consortium of the STEAMonEdu project, which consisted of seven partners from five different countries (Greece, Italy, Germany, Spain, Romania, and Belgium), adopted this bottom-up approach in involving stakeholders who are willing to contribute towards the 2020 EU target of (a) motivating a multi-disciplinary STE(A)M approach, addressing gender gaps and stereotypes in STEM programs and (b) supporting educator preparation for these educational reform movements. The main target group of the project includes all levels of educators (teachers, trainers, tutors), who are interested in practicing STE(A)M education, education and training organizations, researchers in educational methods and techniques, educational authorities and policymakers and also other stakeholders (e.g. career consultants).

To this end, the STEAMonEdu consortium has designed infrastructure for holistic, integrated change by supporting the professional development of educators in STE(A)M education through a competency-based perspective. As a result a competence framework for STE(A)M educators has been developed by taking advantage of the European Framework for the Digital Competences of Educators (DigCompEdu), related procedures regarding STE(A)M education teaching competency and another European framework of teacher competences (N. D. Spyropoulou & Kameas, 2020a, 2020b, 2020c). Tools were also developed, including an instructional meta-methodology, STE(A)M body of knowledge, online activity templates, STE(A)M education good practices and a STE(A)M readiness self-assessment tool. A bottom-up crowdsourcing approach was put in place for the stakeholders of STE(A)M education (including educators, researchers, policymakers etc.), resulting in a peer learning online platform[2] and support in the design and implementation of STE(A)M

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[1] https://steamonedu.eu/
[2] https://steamonedu.eu/platform/

education policies and in the development of open content. Finally, a training curriculum was implemented based on the competence framework, including a blended course and a MOOC.

3. The STEAMonEdu MOOC design

3.1 The STEAMonEdu Competence framework for STEAM educators

Following desk and field research, the first version of the competence framework highlights the multi-dimensional role of the educator and may be used to compose the profile of future educators in different levels and setups of any educational context. Overall, the framework aims to **Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**:

- Be usable by educators for self-evaluation purposes as a self-assessment tool in order to educators evaluate themselves and find specific competences that they need to improve.
- Allow support of professional development of STE(A)M educators, both as a guide for the formulation of the learning outcomes of specific training programs and as an assessment tool for the evaluation of the training program.

The framework, organized in a top-down approach, begins at the top with five perspectives that cover the most important aspects of the educator's roles, as follows:

- **Educator as teacher-trainer-tutor**, implementing the educational procedure. This perspective includes all the required educators' competences during the implementation of an educational procedure that helps students learn. It include competences related to Pedagogy, Content Knowledge, Instruction, Use of content and tools, Feedback and Assessment and Learner empowerment.
- **Educator as designer and creator,** designing and producing outputs. It includes all the required educators' competences related to planning, preparing and developing (a) educational procedures, (b) learning activities and (c) content that are needed in the different phases and settings of STE(A)M-related learning processes. In addition, it features all the supporting competences which aim to boost and facilitate learner development regarding STE(A)M competences.
- **Educator as orchestrator and manager**, coordinating procedures and outputs. It includes all the required educators' competences related to managing and orchestrating (a) the educational procedures, (b) the content and the digital technologies in teaching and learning (c) the lab and its equipment and (c) group of students or/and other educators during collaborative learning activities.
- **Educator as a community member,** interacting with the environment. It includes all the required educators' competences related to interacting and engaging with institutional, business, or other STE(A)M-related communities and applying policies that promote STE(A)M education. With this interaction, educators collaborate and learn (from) other educators and exchange STE(A)M-related experiences.
- **Educator as professional,** developing and applying competences. It includes all the required educators' competencies related to their professional development and transferable and digital skills needed during STE(A)M-related activities.

Each perspective comprises a set of dimensions (competences) that are combined in areas, i.e., coherent groups of competences. Table 1 presents the STE(A)M Educators' competence Framework (Spyropoulou and Kameas, 2020).

Table 1: STE(A)M educators Competence Framework Perspectives, Areas and Competences

STE(A)M educators' Competence Framework

1. Educator as teacher-trainer-tutor / implementing the educational procedure	
1.1 Pedagogy	1.1.1 Understand and use teaching and learning techniques that promote STE(A)M education
	1.1.2 Apply collaborative learning methods in STE(A)M related activities
	1.1.3 Promote self-regulated learning in STE(A)M related activities
1.2 Content Knowledge	1.2.1 Understand what STE(A)M education approach represent and mean
	1.2.2 Understand the content knowledge of STE(A)M-related topics
1.3 Instruction	1.3.1 Provide guidance in STE(A)M related activities
	1.3.2 Act as a facilitator in STE(A)M related activities
	1.3.3 Act as a mentor in STE(A)M related activities
1.4 Use content and tools	1.4.1 Select and use appropriate content and tools for STE(A)M education
	1.4.2 Organize and share appropriate content and tools for STE(A)M education
1.5 Feedback and Assessment	1.5.1 Use assessment strategies for STE(A)M education
	1.5.2 Use feedback techniques for STE(A)M education
1.6 Learner empowerment	1.6.1 Ensure accessibility and inclusion in STE(A)M related-educational procedures
	1.6.2 Ensure active engagement of learners in STE(A)M related-educational procedures
	1.6.3 Ensure differentiation and personalization in STE(A)M related-educational procedures
2. Educator as learning designer and creator / designing and producing outputs	
2.1 Course / curriculum / activity design	2.1.1 Understand and develop STE(A)M-related Curriculum
	2.1.2 Design STE(A)M-related courses
	2.1.3 Design STE(A)M-related educational activities
2.2 Content and tools design and development	2.2.1 Create and modify appropriate content for STE(A)M education
	2.2.2 Design and Develop software and apps for STE(A)M education
2.3 Learner development	2.3.1 Facilitate learners' STE(A)M competences
	2.3.2 Provide guidance for STE(A)M related career opportunities
3. Educator as orchestrator and manager / coordinating procedures and outputs	
3.1 Educational Procedure management	3.1.1 Apply teaching organization methods for STE(A)M education
	3.1.2 Apply classroom management methods for STE(A)M education
3.2 Resource management	3.2.1 Apply educational resources management methods for STE(A)M education
	3.2.2 Apply Lab management methods for STE(A)M education
	3.2.3 Apply human resource management methods for STE(A)M education
4. Educator as community member / interacting with the environment	
4.1 Community building	4.1.1 Engage in STE(A)M communities of educators
	4.1.2 Engage in institutional-based communities for STE(A)M education
	4.1.3 Engage in research and business communities for STE(A)M education
4.2 Application of policies	4.2.1 Apply policies that promote STE(A)M education approach
	4.2.2 Develop policies that promote STE(A)M education approach
5. Educator as professional / developing and applying competences	
	5.1.1 Develop and apply critical and innovative thinking skills

5.1 Transferable skills	5.1.2 Develop and apply interpersonal skills
	5.1.3 Develop and apply media and information literacy skills
	5.1.4 Develop and apply global citizenship skills
	5.1.5 Develop and apply intrapersonal skills
	5.1.6 Develop and apply information management skill
5.2 Digital skills	5.2.1 Develop digital literacy skills
	5.2.2 Manage and use digital tools for STE(A)M education
5.3 Professional development	5.3.1 Adapt self-reflective practices for STE(A)M education
	5.3.2 Participate in lifelong learning experiences related to STE(A)M educational approach
	5.3.3 Act as a Researcher for STE(A)M education

3.2 MOOC development methodology

The MOOC was developed following a collaborative team-based methodology for MOOC development (N. Spyropoulou et al., 2019) and best practices (N. Spyropoulou et al., 2014). This methodology was based on the ADDIE model (**Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε.**, which includes phases of Analysis, Design, Development, Implementation, and Evaluation, illustrating an iterative and self-corrected process since it provides continuous step-by-step assessment.

The design and development of the digital educational material followed an "outcome-based" approach, focusing on what the learners will learn and be able to do as they progress through the course. For the STEAMonEdu MOOC, part of the competences of the competence framework was used as learning outcomes. and then, the learning objects (LOs) were designed according to these learning outcomes. During the design and development phases, educators were given the necessary guidelines to help them design and develop educational material based on LOs. The resulting LOs will be autonomous, retrievable, reusable and shareable to guide instructors and learners appropriately. The quality of the outcomes in each phase of the educational material design and development was assured by the employment of three roles: the author, the technical reviewer, and the scientific reviewer.

3.3 The MOOC educational platform

The STEAMonEdu e-learning platform (Fig. 1) was developed in the Moodle 3.10 e-learning environment. Moodle is a free, online Learning Management system enabling educators to create dynamic courses. The heart of Moodle is courses that contain activities and resources. The design of the interface was realized on a specific theme (Moove) and was modified to provide specific features for the STEAMonEdu e-learning platform. The theme was selected due to its accessibility features for dyslectic users. The platform itself is hosted in an ubuntu Linux environment. The server is set in such a way so that it can hold over 500 concurrent connections of users in the platform.
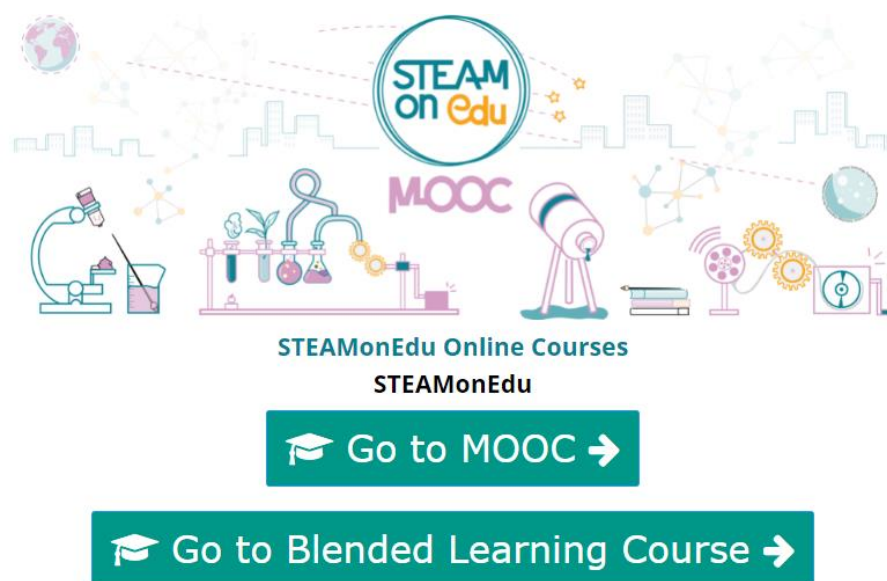
Figure 1: The STEAMonEdu Online Platform Introduction page

4. The STEAMonEdu MOOC structure and description

4.1 MOOC description

The MOOC aims to support the professional development of educators and managers/directors at all levels of education and guides them in becoming STEAM education tutors, designers, and orchestrators. It addresses their need to understand, adapt, apply and create modern STE(A)M educational procedures and practices that enhance the effectiveness and acceptance of short- and long-term educational processes. The primary knowledge domains of the course are:

- STE(A)M education
- Educational leadership
- Management
- Curriculum and instruction
- Educational technology
- Community practice

More specifically, the participants shall gain knowledge and develop competences in the following areas:

- Modern approaches of STE(A)M education
- Design and implementation of STE(A)M educational activities
- Content creation for STE(A)M education
- STE(A)M educational procedure and resource management
- Community building, participation, and interaction
- Policies in the context of STE(A)M education
- Competence frameworks and lifelong learning opportunities.

The course was addressed to all individuals who are interested in applying or finding out about STEAM education, such as:

- active educators at all levels and settings of formal and non-formal education of the relevant subject and related science field of the STE(A)M components (Mathematics, Science, Technology, Arts, Engineering),
- managers/directors at all levels of formal and non-formal education,
- students or graduates.

4.2 MOOC structure

The MOOC spans six weeks and requires an allocation of five to six working hours per week. Each week offers training on two to four selected competences of the STEAMCompEdu framework, delivering each competence via a separate module. Table 1 provides the distribution of the 18 total modules over the six weeks of the MOOC. Each Module includes learning activities, which are further split into learning objects that provide the training content. In addition, one Introductory week was also implemented (Week 0) with some introductory activities (meet each other activities) and information (platform and course guides).

Table 1. MOOC structure

Week	Module Code	Module Title
0	W0.0	Introduction to STEAMonEdu MOOC and platform
1	**Introduction to STE(A)M education**	
	W1.0	Introduction to MOOC
	W1.1	The STE(A)M education approach
	W1.2	Teaching and learning techniques that promote STE(A)M education
	W1.3	Content and tools for STE(A)M education
2	**Educator as learning designer and creator**	
	W2.1	STE(A)M related educational activities design
	W2.2	STE(A)M related course design
	W2.3	Content creation for STE(A)M education
3	**Educator as orchestrator and manager (part A)**	
	W3.1	Teaching organization methods for STE(A)M education
	W3.2	Classroom management methods for STE(A)M education
4	**Educator as orchestrator and manager (part B)**	
	W4.1	Educational resource management methods for STE(A)M education
	W4.2	Lab management methods for STE(A)M education
	W4.3	Human resource management methods for STE(A)M education
5	**Educator as community member**	
	W5.1	STE(A)M communities of educators
	W5.2	Research and business communities for STE(A)M education
	W5.3	Policies that promote STE(A)M education approach
6	**Educator as professional**	
	W6.1	Research activities in STE(A)M education
	W6.2	Lifelong learning and professional development of STE(A)M educators
	W6.3	Digital skills, frameworks and tools for STE(A)M educators
	W6.4	Transferable skills for STE(A)M educators

4.3 MOOC delivery format

All the learning objects are delivered digitally in various forms (presentations, videos, study documents, interviews, activities etc.) and are available online. In addition, participants can join a community of peers by

participating in open discussions and active interaction through a forum. As such, the educational environment of the MOOC is accessible through a personal computer, a tablet, or a smartphone, connected to the internet, equipped with standard audio and visual peripherals (microphone, speakers, web camera).

The MOOC was realized in a grid format, with each session representing a Week. Each week was divided into at least two Modules, and each Module was divided in units. The MOOC provided 19 rewarding digital badges, one for the successful completion of each Module (passing of the corresponding assessment object) and one for the successful completion of all the MOOC modules. In addition, participants that attained a total grade equal to or higher than 75% over all the assessment objects obtained the MOOC certificate. Fig. 3 presents the MOOC delivery format.
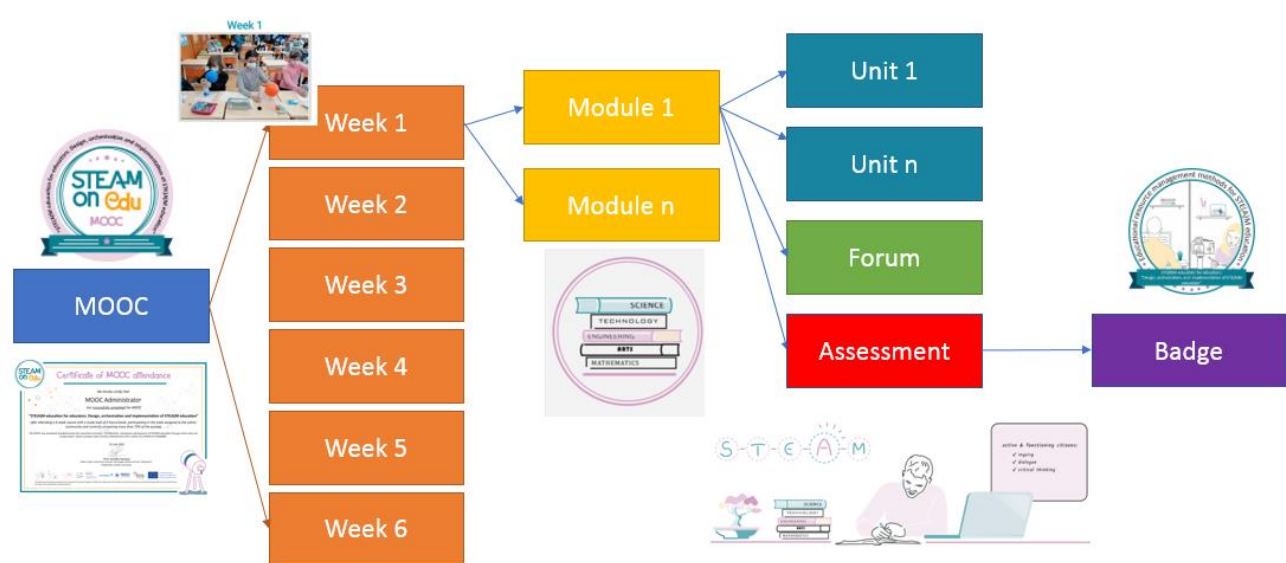
Figure 3. STEAMonEdu delivery format

Overall, the MOOC included 18 modules, 50 learning units, 125 learning objects, and 18 assessment objects with 150 questions. The learning objects (excluding assessment objects) were 88 self-running presentations with audio or video and subtitles in English (see example Fig 4), 11 videos with activities and/or interviews with subtitles in English, 14 study documents and 12 forum topics and interactive activities. Fig. 4 and 5 present examples of the different pages of the MOOC.
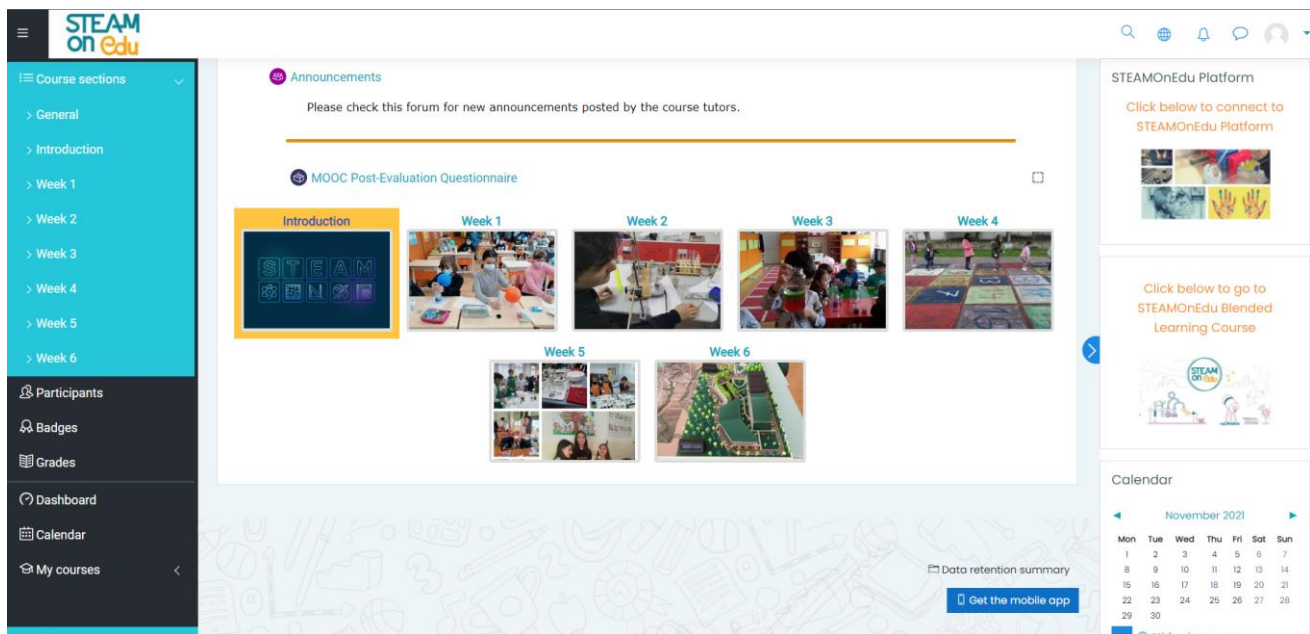
Figure 4. The home page and the overview of the six weeks of the STEAMonEdu MOOC
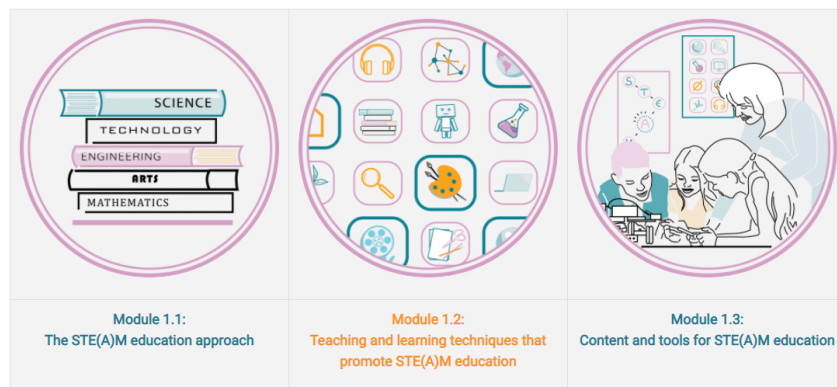
Figure 5. Presentation of the Week 1 information and Modules

5. The STEAMonEdu MOOC implementation and first evaluation

After the first promotional information call on MOOC inaugurated the consortium, more than 1.000 persons expressed their interest in participating in the forthcoming MOOC for STEAM educators. The platform opened in May 2021 and 1.100 persons were registered for the course, and more than 800 have started the training course. The MOOC core training material spanned six weeks, as designed, and it was complemented by an Introductory week in the beginning. The course had a duration of 6 weeks initially, but there was an extension of time so that learners could keep up and repeat units. The MOOC officially ended in August 2021. The prerequisites for successful completion of MOOC were achieving 75% of all completed activities in all Units and successfully answering assessments (quizzes) of the 6-week course.

Until the end of the course, 229 participants with evaluations higher than 75% of the possible score testifies to the effectiveness of the MOOC. Finally, of the 242 participants who completed the MOOC, more than 100 requested to continue with the challenging, intensive blended learning course, more than the 60 places available.

Figure 6 shows the opinions of the responders regarding the benefits of their participation in the MOOC. Access to resources, new knowledge and new skills have the most positive reactions. Expressly, 85.5%, 92%, and 94.1% agree or strongly agree that they gained new skills, new knowledge, and access to resources, respectively. On the other hand, although they received positive opinions (72.8% and 56.7% respectively), getting in touch with experts and collaborating with peers were not highly appreciated. This is not strange since the MOOC does not include any live session that would facilitate interaction with experts.

On the other hand, managing collaborative activities in the context of the MOOC, where people follow their own pace, is not easy; in fact, it is not feasible to synchronize all the participants and try to manage the ones with similar pace is rather cumbersome and dubious. Moreover, the MOOC requires a significant workload, and pressing the participants further might result in the denial of participants and drop out. While the number of posts exchanged among the MOOC participants in the context of the forum topics was high, namely, 58000 posts for 20 forum topics, showing a good level of interaction, the peer-to-peer collaboration did not flourish. The certification, on the other hand, was more appreciated than initially expected.
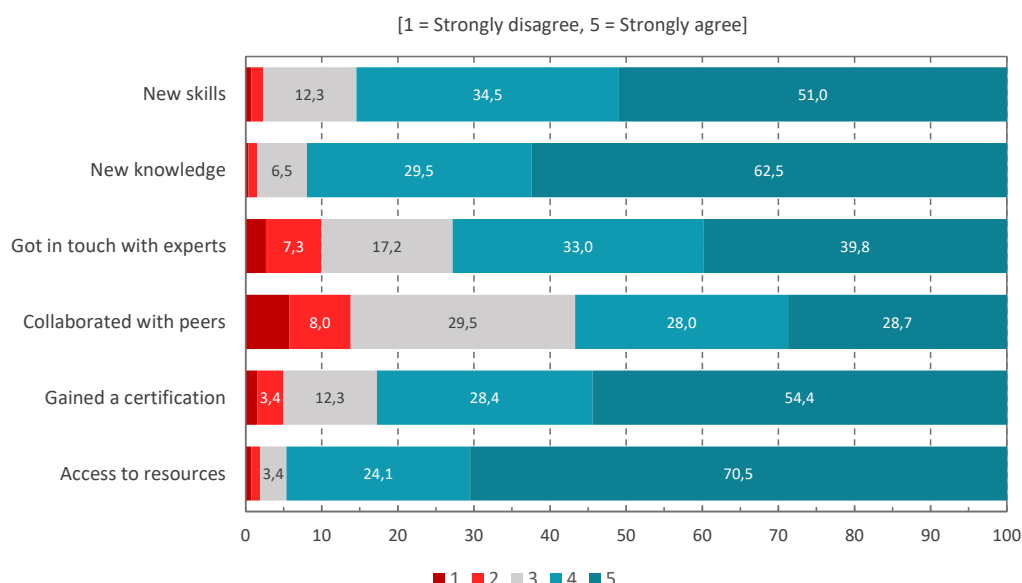

Figure 6. Results on the question "What did you gain most from taking part in the course (261 answers)

In addition, for the evaluation of the MOOC, we used post-surveys with specific questions regarding the Structure, Material, Platform, and Tutoring, and the overall results are presented in Figure 7. Regarding the Organization, the course was well organized regarding weeks, modules, and activities (4.61 av.). Furthermore, the learning material was characterized as high quality and suitable for achieving the course objectives (4.55 av.), the platform had a positive score based on the questions (4.41 av.), and finally, the tutors were characterized as available and approachable with an average score of 4.32.

Figure 7. MOOC evaluation regarding Organization, Material, Platform and Tutors

6. Conclusions

This work constitutes a presentation of a MOOC for the professional development of STEAM education, along its design and development. The MOOC was formulated based on the Competence framework for STEAM educators (STEAMCompEdu), which aims to support STEAM educators. In this paper, the methodology and toolset used by the consortium in developing the training program were described, while its first evaluation, which took place in 2021, was presented.

7. Acknowledgments

The research presented in this paper has been partially funded with support from the European Commission in the context of project STEAMonEdu (Agreement n°: 612911-EPP-1-2019-1-EL-EPPKA3-PI-FORWARD. Project n°: 612911). This paper reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

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Online Assessment

Assessing the role of the weekly compulsory activities in the effectiveness of the learning process in a postgraduate program at the Hellenic Open University

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Abstract

At the postgraduate program "Education and Technology in distance teaching and learning" (School of Humanities) of the Hellenic Open University (HOU), the content of each module is provided in weekly topics, which gives students the chance to better organize their studies. One of the most important elements of the learning material is the fact that it provides students with the opportunity to regularly test their knowledge through self-evaluation exercises and compulsory activities.

Even though the compulsory activities are given on a weekly basis, as an integral part of the learning material, the deadline for submission is open by the end of semester. Students are encouraged to follow the proposed timetable but are free to study at their own pace and time, according to their other obligations and constraints. For the compulsory exercises, the necessary feedback is provided by the learning material (at the form of proposed answers), as soon as the students upload their answers, and then the students can check their answers accordingly. The responses to the compulsory activities constitute students' own personal e-portfolio, which is graded at the end of the semester.

In their previous research, entitled "The role of assessment activities in students' interaction with educational material in a distance postgraduate program: the case of the ETA 50 module" (Kelesidis, Zakopoulos & Chartofylaka, 2022), the researchers focused on a specific module (the first module of the postgraduate program) and examined the study course of the students in relation to the completion of the compulsory activities and the role they play in the feedback and consolidation of the weekly learning material.

Based on the findings, the researchers assessed that the research should continue, in order to illuminate the students' actual viewpoints: how they interpret the role of the compulsory activities to their study course; how they evaluate the activities upon their type, content and feedback; how they assess their contribution to the overall study and evaluation process; how they cope with cooperative activities; which are their suggestions, etc. Therefore, for the current study, a specially designed semi-structured questionnaire was used, in order to

gain an insight into students' own views and perceptions upon the aforementioned issues. The data analysis was conducted through MAXQDA 2020 software and the results highlighted the importance of compulsory activities to the successful completion of students' course/pathway. According to the research findings, students highlight the importance of polymorphic learning material and the structure of each module to the successful completion of their studies. They suggest more personalized feedback to the compulsory activities and more collaborative activities, which shall bridge the distance and increase interaction and communication.

Keywords: distance learning; compulsory activities; self-assessment activities; evaluation; feedback; collaborative learning

1. Introduction

Educational research has shown that it is essential for educational systems to establish a dialogue between learners and educators on educational process, as a vital requirement for developing new mediation tools and practices either in the school (Clark, Logan, Luckin, Mee, & Oliver, 2009) or university context (Conole, Creanor, Irving, & Paluch, 2007). In higher education, students can take an important role in providing information about how learning takes place and which technologies and learning environments best meet their needs (Gros & López, 2016). As Wright (2012) states, "powerful learning begins to manifest when students take responsibility and ownership for their learning when they become co-creators of their learning experience, rather than their education being something that is done to them. True student empowerment and engagement begins when we cross the threshold of co-creation". However, the opportunities to contribute as partners to the design of learning scenarios or programs are very scarce (Gros & López, 2016; Bovill, Cook-Sather, & Felten, 2011).

In addition, as recent research by Brown and Baume (2022) showed, the research findings may put the well-established practices into investigation (and that's another reason why best practices should be tested regularly):

> Published research on best practices in student learning stresses the value of active learning and of student collaboration. By contrast, our respondents report that they regard more active individual learning components such as reflection and self-assessment exercises as less helpful than course content such as readings, and they rate peer engagement much less highly than individual learning.

In the present study, we examine students' beliefs and experience from the postgraduate program 'Education and Technology in distance teaching and learning' (School of Humanities) at the Hellenic Open University (HOU) with the aim to discuss issues, such as: how they interpret the role of the compulsory activities to their study course; how they evaluate the activities upon their type, content and feedback; how they assess their contribution to the overall study and evaluation process; how they cope with cooperative activities; to what extend do they prefer collaborative learning activities. The research findings intend to be used to articulate the implementation of concrete actions so that the "student voice" can really have an impact on learning process and the curriculum design as possible.

2. Course design main characteristics

Content design

At the postgraduate program "Education and Technology in distance teaching and learning" (School of Humanities) at the HOU, the content of each module is provided via a Virtual Learning Environment (VLE), being divided in weekly topics, which enables students to better organize their studies towards an autonomous learning path. One of the most important elements of the learning material is the fact that it provides students

with the opportunity to regularly test their knowledge through self-evaluation exercises and compulsory activities. The task of designing effective weekly learning activities for adult distance learners has been of great importance in the light of the ongoing process of digital transformation in higher education, and foremost in open and distance learning itself. In the same vein, the interplay of teachers and students turns important in the design of quality distance teaching and learning to foster students' knowledge and skills.

Brown and Baume (2022) classify content in three distinct categories: content, which includes reading a text or watch a multimedia object, individual activities of any form, and shared activities, such as group work and online fora. Even though the content itself as well as the writing style are the main criteria to define, whether a content is a passive or an active component for students, nevertheless, literature (Brown & Baume, 2022; Laurillard, 2013) characterizes content, such as readings and video, as passive learning, while activities (individual and shared), as active learning. In addition, shared activities, require and develop social skills including listening, empathy, helping, co-creation, negotiation, and compromise (Brown & Baume, 2022).

Expected outcomes

According to Chickering's model (Chickering, 1969; Chickering & Reisser, 1993; Hattie, 2009a), higher education programs aim mainly at the following seven outcomes: (i) achieving competence, (ii) managing emotions [from those that interfere with learning (anger, anxiety, hopelessness) to those that assist (optimism, hopefulness)], (iii) mature interpersonal relations [respecting differences, working with peers (probably the most underestimated power in higher learning)], (iv) moving from autonomy to independence (moving from needing assurance and approval of others to self-sufficiency, problem solving, and making decisions), (v) establishing identity (self-esteem and self-efficacy), (vi) developing purpose, (vii) developing integrity. All these outcomes are expected to be achieved through students' interaction with the teaching material, the tutor and among themselves. To this end, assessment of students' learning should be diagnostic, formative, and summative, "focusing either on 'knowledge control,' where the learning outcomes are seen as recollection of factual knowledge or skills, or on 'assessment as learning,' where the learning outcomes are seen as a competence-based curriculum which fosters the development of competence and capability" (Doukakis et al., 2021).

Different types of assessment

According to Biggs (1999, 1996), the discussion about assessment and its different types should rather focus on what he calls "constructive alignment". This notion has two premises: students construct meaning from what they do to learn; and the tutor aligns the planned learning activities with the learning outcomes. Thus, the learning activities and assessment tasks should be aligned with the learning outcomes that are intended in the course and are imposed by the program. Both the "learning intentions" and "success criteria" should be part of the learning activities narrative, as they mark the target towards which the learning pathway is built.

According to Ruth (2007), there are three basic learning levels that educational designers need to consider: *surface knowledge* necessary to understand concepts; *deep understanding* of the ways in which ideas relate to each other and develop in other ways; *theoretical thinking* which allows surface and deep knowledge to transform into hypotheses and concepts on which new surface and depth understandings are built. Thus, students should not be encouraged to rely their learning on memorizing concepts and experiments (Seritan et al., 2018), nor should they try to guess which part of the learning material is emphasized by the tutor so as to focus only on that. On the contrary, using 'backtrack learning design' (Hattie, 2012), meaning providing the educational objectives and the criteria for assessment before engaging into the learning activity, could maximize learning (Jeffrey & White, 2007).

The importance of feedback

For a learning activity to be more effective, feedback is among the most "powerful influences on achievement" (Hattie, 2009a, b; 1992), as it reduces discrepancies between current understandings and performance and learning objectives or goals. Feedback has differing effects across the level of task performance, the level of process of understanding how to do a task, the regulatory or meta-cognitive process level, and the self or person (unrelated to the specifics of the task). To this end, the weekly compulsory learning activities not only constitute an indicator for students' achievement, but mainly they provide the opportunity for feedback and interaction between tutor and student.

These strategies intend to establish quality in a distance tertiary education program. According to Oliver (2001), the achievement and maintenance of quality in online tertiary education depends on a number of issues and strategies, such as the development of proactive programs to improve teacher expertise in online teaching; programs to support and maintain student readiness; the need to provide adequate technology infrastructure to support the programs; and the use of strategies supporting the design and development of online programs based on the customization and reuse of learning objects. On the other hand, Biggs (2001) describes the concept of quality in higher education as comprised of three main elements: (i) value for money, (ii) fit for the purpose of the institution, (iii) transforming, which highlight the importance of students' achievement and perceived feeling of success as key factor of maintaining and promoting the quality of teaching and learning in a distance learning program.

However, what is most important in distance learning is whether students are gaining skills and competencies of a wide range and of value to them. Lohr et al. (2021) suggest that students' digital learning activities should be systematized based on the ICAP (Interactive, Constructive, Active, and Passive learning activities) framework (Chi et al., 2018; Chi & Wylie, 2014). According to the ICAP framework, online learning activities are of four types: passive, active, constructive, and interactive, each of which is associated with different types of cognitive processes and different resulting learning outcomes (Chi, 2009; Chi & Wylie, 2014). The ICAP framework emphasizes and expands on the concept of active learning, which is widely accepted in in the higher education context (Wouters et al., 2008; European University Association, 2019), as it increases students' learning outcomes (Freeman et al., 2014). Thus, there is a need for effective and appropriate use of assessment techniques via the learning activities, in order to improve students' learning process.

3. Research questions

Based on the afore-mentioned context and applied research into distance learning student behaviour, the following research questions emerged:

1. How do students evaluate the overall role of the compulsory activities to their study course?
2. How do students evaluate the feedback they get on the compulsory activities?
3. How do students evaluate the weight of their performance at the activities, in the overall grade?
4. How do students evaluate the collaborative activities?

It should be noted here that the specific postgraduate program is a relatively new program (operates for 2 years), which is an additional reason, why the findings would be useful for future updates.

4. Research design

For the current study a, specially designed, semi-structured questionnaire was used, to gain an insight into students' own views and perceptions upon the afore-mentioned issues. As the researchers, in this following article, were more interested in qualitative findings, open questions were used to record students' opinions and perceptions (Cresswell, 2014; MacDonald & Headlam, 2015). On the other hand, in some of the "closed" questions addressed, variables were measured using the 5-point Likert scale (1 = totally disagree, 5 = totally agree). The sample for the current study consisted of seventy-four (74) students enrolled in the postgraduate program at HOU during the academic year 2021-22. Data was collected through questionnaires at the end of May 2022. The questionnaire was developed and divided into two sections, including: a) students' individual characteristics, b) closed questions and open questions addressed. The open questions were used as a follow-up to the closed ones in an attempt to get an insight and illuminate students' genuine perspectives and viewpoints.

The online survey was distributed to all students (N=250) who were studying the first module (ETA50) of the postgraduate program. 74 responses were received, which is approximately the 30% of all students. The questionnaire consisted of four questions on demographic and individual characteristics, gender, age, profession and ICT knowledge, and ten questions where students expressed their opinion about the compulsory and self-assessment activities.

Data was processed, and all hypotheses were tested and analyzed through MAXQDA 2020 software and then analyzed and coded into thematic categories. The results highlighted the importance of compulsory activities to the successful completion of students' course/pathway.

5. Research findings

Participants' profile

The profile of the students who participated in the research is the following. Regarding gender, 86.5% were women and 13.5% were men. Regarding age, 40.5% were between 31-40 years old and 32.4% were between 21-30. Regarding their occupation status, most of them (97.3%) are employed; the 71.6% of them in school (primary and secondary) education. Finally, most students have moderate to good knowledge in ICT (Mean =3.38, SD=0.84).

Regarding the reasons for which they say that they mainly enrolled at the program, 68% answered that they chose it because of the flexibility they could have by studying from distance, the opportunity to deepen their knowledge in distance learning methodology and finally, the accreditation that could be used in various ways at their occupation (for example, a future promotion).

The following findings are directly linked to the research questions the researchers posed.

Participants' viewpoints on the role of the compulsory activities

Participants were asked to evaluate the elements that they consider as innovative in the program they study. After analyzing the answers, 11 thematic categories emerged, with the most important for them being: 1) the polymorphic educational material of the program, its structure and variety (49%), 2) the weekly compulsory activities, as well as the self-assessment activities (19%) and 3) the autonomy they were given through flexible submission dates, which helped them develop a personal pace in their learning path (12%).
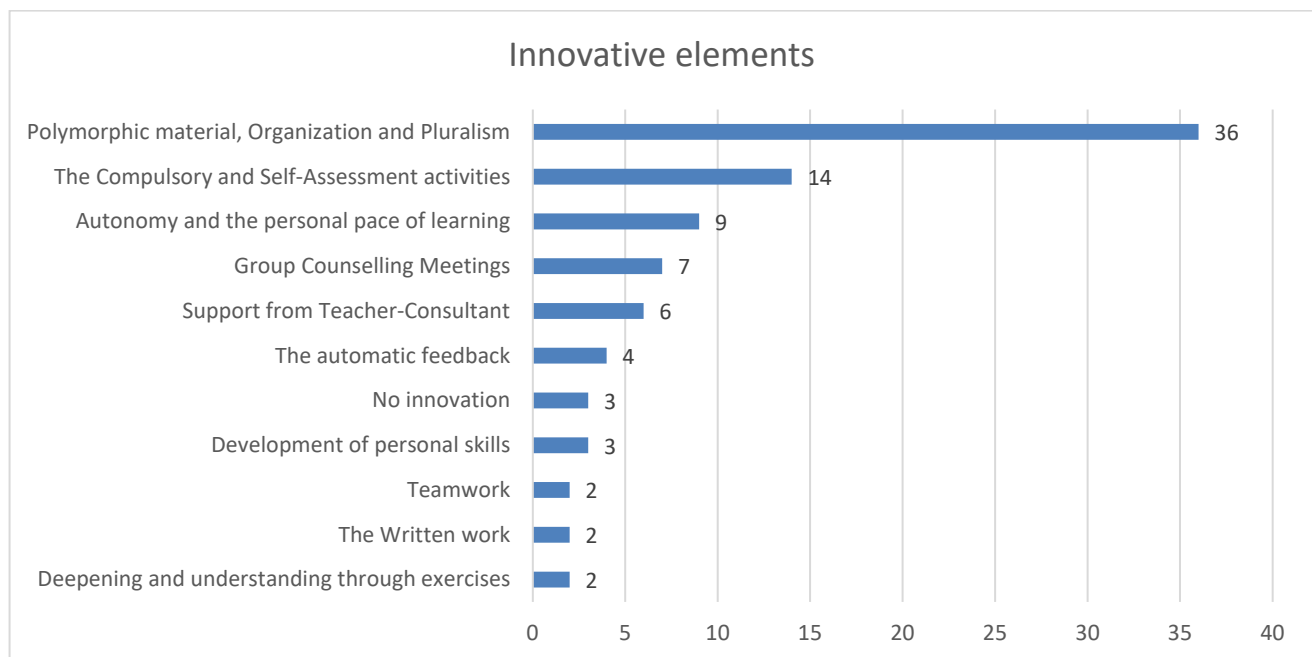
Figure 1: Innovative elements of the program, evaluated by the students

In the following question, participants were asked to express their viewpoints specifically on the weekly compulsory activities. The students expressed their opinion in an open text form and from their answers emerged that they value the positive way contribute to their course of study. More specifically, 72% believe that the activities are necessary to their studies, while 57% appreciate the feedback provided. On the other hand, 24% stated that the activities were too many. This final finding also emerges at the end of the questionnaire, where students express their suggestions on the improvement of the activities.
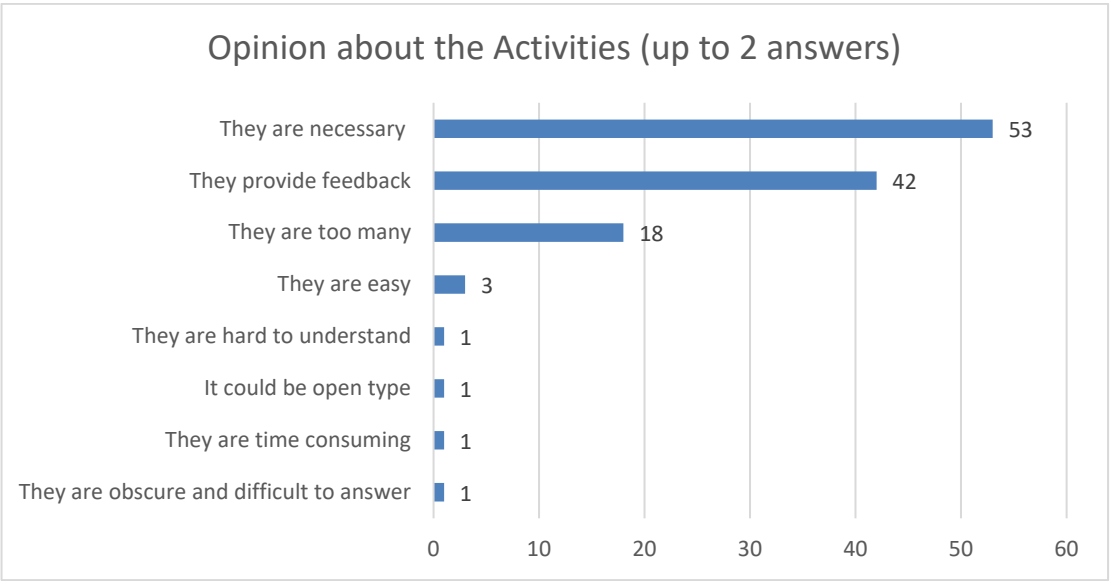
Figure 2: Students viewpoints on the role of the compulsory activities

To a very large extent, students believe that the compulsory activities serve their purpose, which is to interact with the learning material of each week (thus, enable active learning) and deepen their understanding (Mean =4.01, SD=0.65).
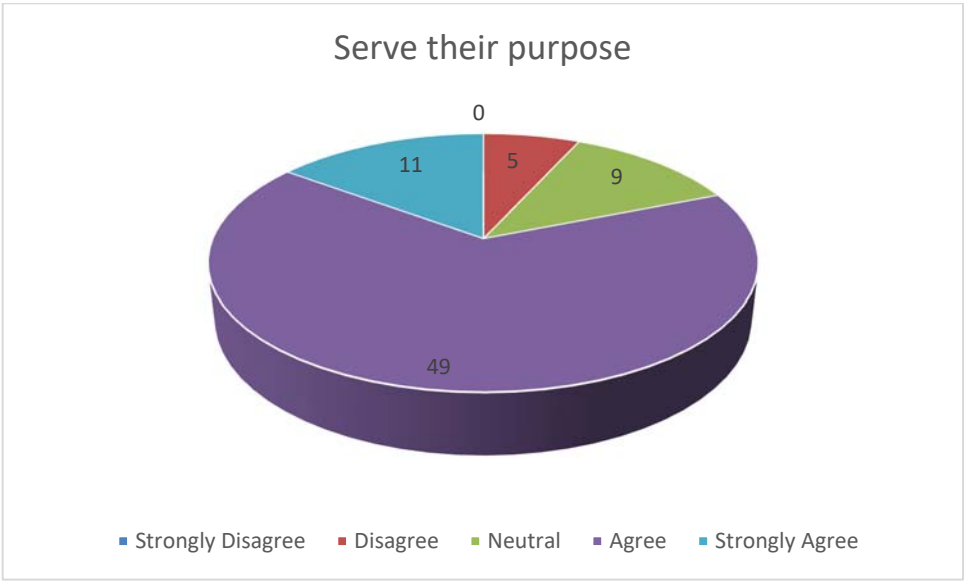
Figure 3: Students viewpoints on the necessity of the compulsory activities

Participants' viewpoints on the acquired feedback

The participants express their concern on the feedback they get, since the answer is predefined as part of the prepackaged material, thus not personalized (Mean =3.00, SD=0.97).
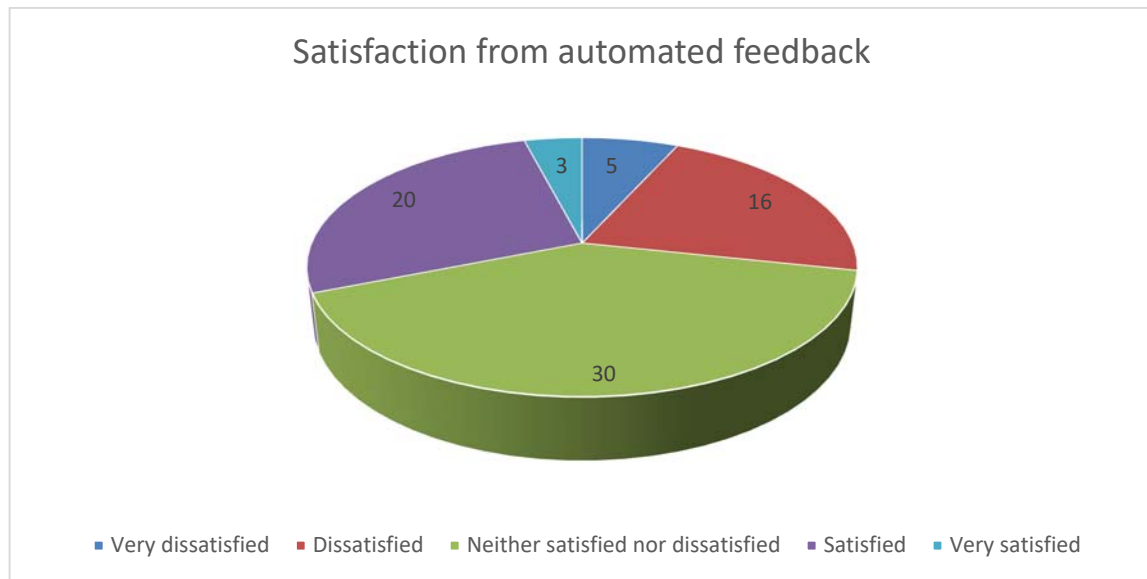
Figure 4: Students' satisfaction of the pre-packaged feedback

The specific viewpoint was expressed again at the end of the questionnaire through an open form question, where students would make their own suggestions on the improvement of the activities. According to their opinion, the personalized feedback from their tutor would be of higher value to them, compared to the ready-made answers they get.

Concerns on the weight of the compulsory activities in the overall grade

According to the participants, the hours spent on the compulsory activities cover a significant percentage of their overall study time; nevertheless, they find it somehow contradictory that the weight in the overall grade of the module is only 10% (Mean =2.49, SD=1.06). At their final suggestions, students claim that the impact/percentage of the compulsory activities to the overall grade should become higher, thus reflecting their efforts.
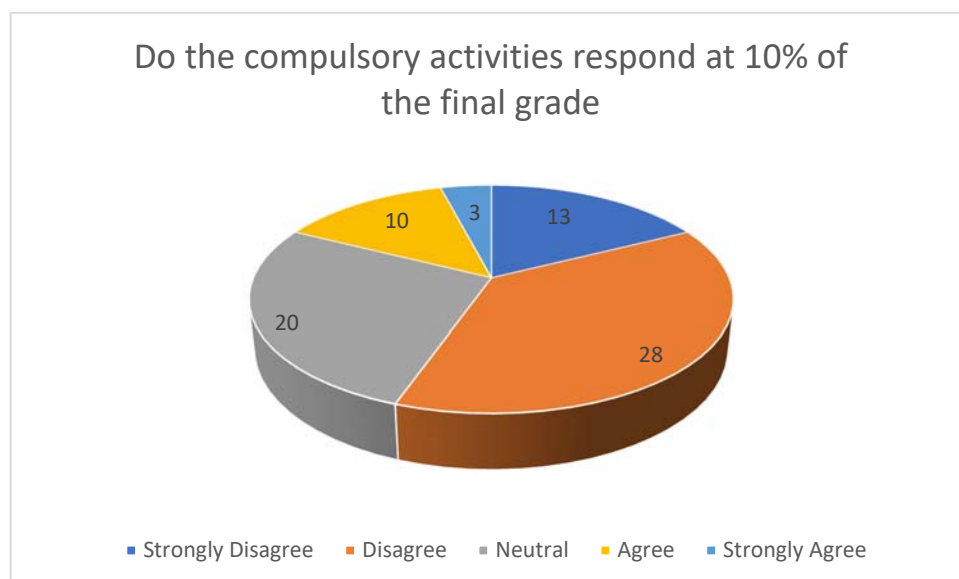
Figure 5: Students' perception of the activities' weight at the overall grade

Participants' viewpoints on the role of the self-evaluation activities

The self-evaluation activities are also an integral part of the prepackaged learning material and are designed to enable the students to interact with the content. They also have a ready-made answer which is provided as a feedback. Nevertheless, they do not count in the overall grade and are optional.

According to their answers, students find the (optional) self-assessment activities useful within the module (Mean =3.50, SD=0.98), however less than the mandatory ones (Mean =4.01, SD=0.65).

Participants' viewpoints on collaborative activities

Regarding group activities, the survey showed that the students find them very useful, not only for educational purposes but also for social ones (57%); they state that through these activities there is an improvement in the communication, cooperation and mutual support between the team members (20%). They also claim, and that is extremely important to avoid student retention, that group activities give them a sense of belonging (19%), enhance their learning (14%) and provide them the practical and psychological support they need (7%). Through interaction in group activities, they solve queries (7%), share common experiences (5%) and enhance their personal development (9%).

However, some students do not wish to collaborate and prefer to work individually on individual tasks (12%).

Figure 6: Students' viewpoints on collaborative activities

Participants' suggestions on the improvement of the compulsory activities

At the end of the questionnaire, the participants had the opportunity to express their own suggestions for the improvement of the compulsory activities. Besides the topics that are directly linked with the research questions, it is very important to note down the following suggestions:

- Evaluation of the pre-packaged answers: besides their need for personalized comments by the tutor, the students note that the pre-packaged answers should be more clear and precise.
- Evaluation of the date that the grade is received: even though the students get their feedback right after the submission of their work, the grade becomes known at the end of semester. In that way, they do not know how they performed and that makes them insecure about their study course. They state that they would prefer to get their grade with the feedback, in time.

- Finally, students comment the similarity of the activities. Since most activities demand an academic text as an answer, students recommend a variety of activity types to make them more interesting and appealing.

Finally, correlation checks were carried out between the responses with their demographic characteristics, gender, age, work, and knowledge in ICT, through the MAXQDA, where no correlation was found.

6. Discussion

Based on the research findings, the research questions were answered sufficiently, even though the restrictions of the research would not let us generalize the outcomes. The main topics that emerged are the following.

Students' evaluation on the overall role of the compulsory activities

From the participants' answers in a variety of (closed and open form) questions derive that students acknowledge the overall positive role of the compulsory activities in their learning efforts. According to them, the compulsory activities form part of a vivid, polymorphic learning material, provide them with opportunities to interact with the content and help them acquire new knowledge in an active and sufficient way; they value active learning to their study course and performance and their viewpoints align with the literature review, according to which "the more distance learning students engage with their courses, the better their academic achievement tends to be" (Firat et al., 2019).

Nevertheless, the participants pinpoint the fact that the total number of activities is high (one activity per week) and they often get overwhelmed by the workload. This is a common finding in relative research in the field of tertiary education distance learning, especially in studies on student retention (Simpson, 2003; Simpson 2013) and student satisfaction in distance learning programs, according to which "Many students report that demands of family and work reduce the time available for study below levels they are comfortable with" (Brown & Baume, 2022; Brown et al., 2020).

Granger and Benke (1998) give us a general profile of distance learners:

> The majority of distance learners are adults beyond the traditional age of undergraduate college attendance. They are returning to education usually for an identifiable reason: to qualify for promotion, to prepare for a new job, because their employer expects it, or even because it's something they now want to finish. In many cases, returning learners are goal oriented (e.g., gaining the degree or certificate) more than task-oriented (anticipating the actual study and learning process). Distance learners usually have busy lives already, and education must compete with jobs, childcare, household responsibilities, etc.

This is an important finding that should be taken into consideration by the course designers in future versions of the program.

Students' evaluation on the automated feedback

Even though the participants are positive that the automated feedback they get is important to them while they study, they state that they would prefer a personalised answer from their tutor than a ready-made answer from the pre-packaged material.

This finding is in line with the students' answers in a previous question, where they state that the role of the tutor support as well as the role of the Group Counselling Meetings that takes place once a month through

teleconference, is very important to them. It also conforms with various research (O'Donnell et al, 2013; Whalley et al, 2012) that show that students need a more personalised approach, which leads us to a swift of paradigm from the pre-packaged content to more tailor-made, personalised content and services in e-learning programs.

On the other hand, their answers could also be interpreted as an evaluation of the specific pre-packaged answers. This interpretation can also be linked to their suggestions at the end of the questionnaire, in which they stated that they would prefer more clear and precise answers.

Compulsory activities and grade

The submission of the compulsory activities (13 in total) corresponds to the 10% of the overall grade. The participants were asked particularly about that in a specific question. Their answers led to another important aspect of the participants' viewpoints on the activities; the fact that they link their efforts with the grade they finally get. Specifically, even though they state that the activities help them to better understand the content, at the same time they wish that the hours spent on them would be redeemed on the final grade. On the one hand, students acknowledge the activities' role to their learning path and understanding of the material; on the other hand, they would appreciate, if the time spent studying them, would be acknowledged more efficiently.

This may also be linked with their perception on the role of the (optional) self-assessment activities; according to their answers, the students find them useful, however less than the mandatory ones, even though the main difference between the two categories is in fact that the self-assessment activities are not graded.

This is another challenge for the course designers and another problem to be solved. Are the compulsory activities a chance for active learning or are they tools for evaluation? What is the balance between learning support and performance evaluation?

Collaborative activities

During the course, several activities can be performed in teams. This is optional, since students who wish to study individually, can proceed with the activities on their own. Best practices show that peer interaction helps students overcome isolation and may lead to better results. Nevertheless, Brown and Baume (2022) found that their respondents' "report that they regard more active individual learning components such as reflection and self-assessment exercises as less helpful than course content such as readings, and they rate peer engagement much less highly than individual learning".

In the case of the current study at the HOU, most respondents (88%) answered that they found that kind of collaboration very useful. They highlighted the activities' contribution to the social aspect of learning and valued the improvement in the communication, cooperation, and mutual support between the team members they earned. They also expressed that the interaction with their peers gave them a sense of belonging to the HOU community, which is a factor that reduces students' retention rates (Lionarakis et al, 2019). They valued the support they got form the activities as learning opportunities (solve queries, exchange viewpoints, co-write etc.) and social opportunities (share common experiences, engage with their pears) and they believed that the activities contributed to their personal development. These findings align with the literature review, according to which cooperation also typically has positive impacts on learning (Johnson et al., 1981; Kyndt et al., 2013; Roseth et al., 2008; Niari, 2021). Thus, there is a strong argument in favor of encouraging students to collaborate with their peers in learning activities" (Brown & Baume, 2022).

On the other hand, several respondents (12%) stressed their concerns on group activities, which are mainly linked with the lack of time they have and, in some cases, the different time zone. Tutors often were asked by the students whether they could proceed on their own to perform the activities. It would be very useful to identify the actual reasons, why some students are reluctant to collaborate, since both arguments (limited time and different time zone) may not be the case: the effort to be used in a group activity is not more than studying individually and the numerous tools for asynchronous cooperation overcome the obstacles of the different time zone and very busy schedules. But this is the case for another research.

7. Research limitations

There are not many studies, that have been conducted, concerning the assessment of the role which the weekly compulsory activities play in the effectiveness of the learning process in a postgraduate program at the HOU. However, there are still a few limitations to the current research, such as the content of the activities that possibly influenced students' answers, the small sample of the study and therefore the restriction of making general conclusions that could be applicable for the other modules of the same postgraduate programme. There is also the need for an ongoing research, since the postgraduate programme, as a new one, each year evolves and updates its features and activities based also on students' and professors' feedback.

8. Conclusions

Through this research, the researchers aimed to establish a dialogue between students, tutors and course designers, and evaluate one of the program's main characteristics, the compulsory exercises. The research findings showed that students acknowledge the overall positive role of the compulsory activities in their learning efforts but question three main elements: the high number of activities they have to complete until the end of semester, the faint effect of their answers in the overall grade and the lack of personalized feedback by their tutor. Finally, most of them gave a positive feedback on the collaborative activities, by highlighting the activities' contribution to the social aspect of learning and the improvement in the communication, cooperation, and mutual support between the team members they earned from them.

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Creating good online exams: An educator's perspective

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Abstract

The present study considers a project of creating and maintaining the framework that enables the realization of the online examination procedure in a more individualized approach. The project is hosted in the cloud platform SYLVA, which, according to its creators, is an integrated learning and assessment platform with intelligent automated grading and interactivity. For this purpose, the use of CREO authoring tool, supported by a dominant CAS software, *Mathematica*, is demonstrated and evaluated for the creation of exams and self-tests. The relative merits of using SYLVA for remote online examinations in disciplines where it has a well-proven track record are also stated.

Keywords: online assessments, automated grading, Wolfram language.

1. Introduction and motivation

As course administrators, instructors are in charge of organizing their course contents in concise and brief tests and assessments, along with other benefits that can be derived, such as the determent of cheating and the development of distance learning alternatives. Several strategies commonly used to secure that students won't look at a classmate's screen when taking an online exam (organized remotely or in the classroom) is the random shuffling of a certain set of questions and the random selection from a larger question bank so that each student is assigned a different set of questions. However, the random shuffling of a certain set of questions is not quite trustworthy while the random selection from a larger question bank does not ensure individual equality.

Some of the key challenges when assessing and evaluating students' performance are: (i) large class sizes in obligatory courses, ii) ensuring fairness when grading (iii) automated grading of open questions, iv) creating assessments of an equivalent level of difficulty in multiple examination groups and v) revise the grading both before and after we publish the grades. OECD (2020) and Guàrdia et al. (2017) raised a complete list of concerns about remote online exams.

If the same set of questions is not able to evaluate students' theoretical and practical knowledge and skills in a single or multiple examination groups and fails to combat students' academic dishonesty, then it might be difficult to incorporate consistency in facilitating the (remote) online exams.

In learning management system SYLVA[1] (Meusel, 2019), the creation of a customized test where each student is assigned a different set of questions of the exact same difficulty is feasible. The parameterization option in CREO authoring tool is the key component. In this direction, another good practice supported by CREO is the creation of a pool of possible correct and incorrect answers for a multiple-choice question where a certain number of them are randomly selected. This way, different choices for the same multiple-choice question appear in each student's interface. CREO options for test questions include also the "interactive type" of test question, whose output is an interactive object containing one or more controls that can be used to vary the

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[1] https://www.sylva.ac/

value of the parameter list. This interactive output is very much like a small widget: it is not just a static result, it is a running program that can be interacted with. Students should be quite focused on the visual or analytical interactive output to indicate the correct result. This prevents them from co-operating, especially when the examination time is limited.

Programming in CREO uses the Wolfram language. The computer algebra system Wolfram Mathematica (Wolfram Research, Inc. 2018) is employed to create components of questions for exams and self-tests, to interact with the user, to display symbolic expressions, data structures, and numerical and graphical calculations. Mathematica provides various visualizations, such as tables, heatmaps, maps, and traditional statistical charts, as well as customizations, with controls added for user intervention. Multiple-choice, multiple selection, true/false, as well as open questions can be programmed in CREO and can be automatically graded.

The contents of this study are organized as follows. Section 1 is introductory. Section 2 is technical and contains some installation tips. Section 3 is the main part of the study where the programming procedures of 1) parametrization, 2) customization of possible answers in a multiple-choice question and 3) interactivity, are demonstrated through examples. Section 4 highlights the key benefits of online examinations in SYLVA. Section 5 concludes the paper.

2. Installation tips

SYLVA is an online platform targeted to instructors who want to use assessments and courseware for many students in their courses. No local installations, no files, and no additional tools are required for SYLVA. Users will need a strong internet connection and Mathematica as required software.

CREO is the authoring tool where the instructor can create and directly distribute courseware and assessments in SYLVA. CREO is available for download after the creation of the first course in the Administration app. CREO is built on Wolfram technologies, which means that Mathematica interface gives access to CREO (after the installation, CREO is included in the Palettes menu).

3. Suggestions for the structure and development of good test items in SYLVA

Some advanced settings for test questions and answers that would come in handy are demonstrated through the following examples.

These examples are tailor-made for the curriculum of the courses "Data analysis in MSExcel (Spreadsheets for Economic Analysis)" (figs 1, 3, 4) and "Computational Economics" (figs 2, 5, 6) at the Dept. of Economics, University of Thessaly, Volos, Greece. Questions were employed in the exams of these courses to an audience of 200 and 50 students accordingly.

3.1 Design and implementation of parametrization in assessment features

Parameters can be used in any type of question (free response, multiple-choice or interactive response), in the introduction field, the text field, or in the multiple answers. Parameters can be custom numbers defined by the user or by Wolfram's random number generators. Automated grading is feasible in any case.

In this example, students are tested on annuity functions in MS Excel and specifically in the implementation of the future value (FV) function. The question in fig. 2 states: At the National Bank of Greece, we have 10 depositors. To calculate the final (future) value of their investment when they deposit a fixed amount of €*'parameter 1'* (parameter 1 running from 3 to 6 in steps of 0.5) each month with a fixed interest rate of *'parameter 2'*% (parameter 2 running from 75 to 600 in steps of 15) for 36 months. Depositors 2, 4, 5 deposit the amount at the beginning of the month while the rest at the end of the month. To give the final (future)

value of the *'parameter 3'*th (parameter $3 \in \{1,3,6,7,8,9,10\}$) depositor. The amount is to be rounded to the nearest integer.
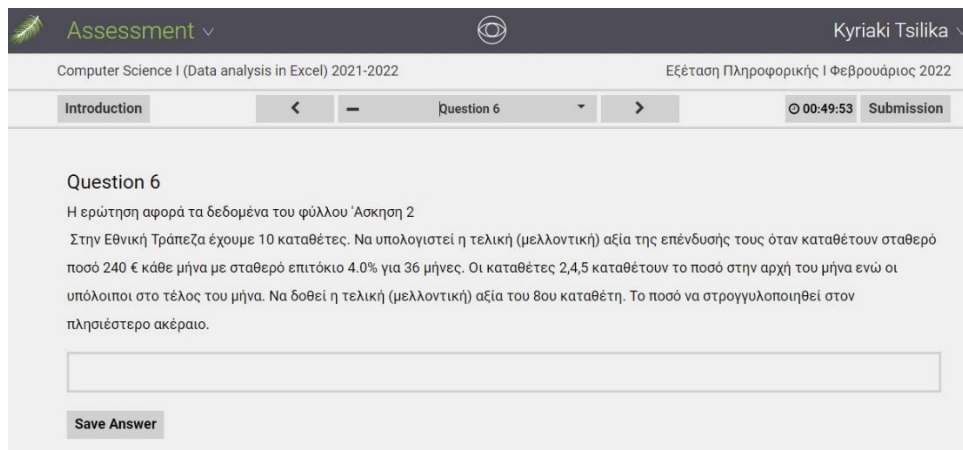

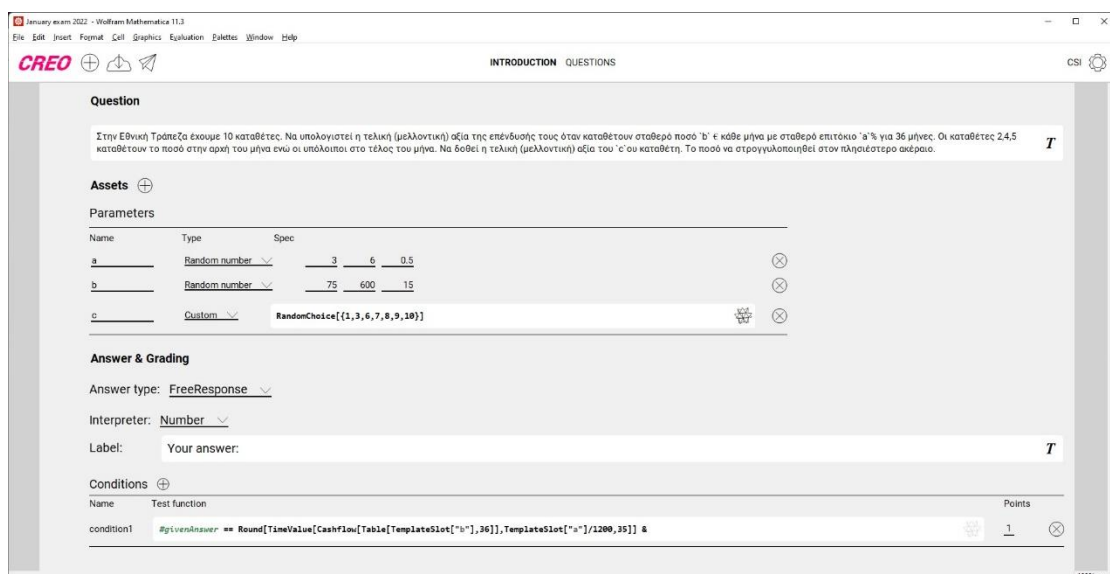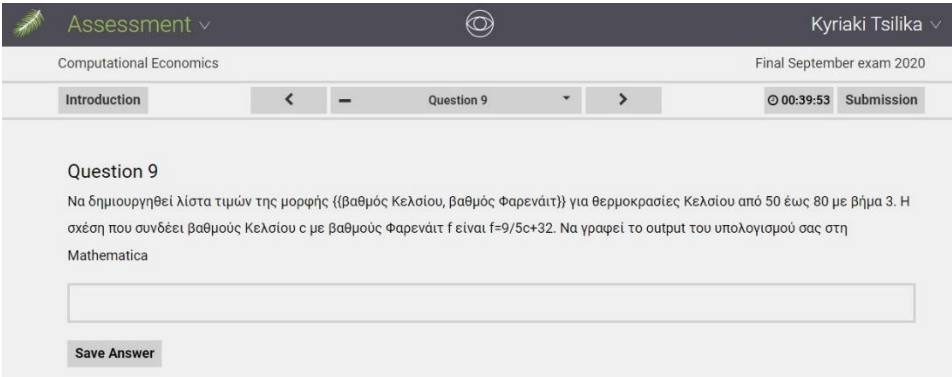Figure 1a: The question preview. Each student sees a differentiated question.

Figure 1b: The question setup in the authoring tool CREO. Coding is implemented in the Wolfram language.

In the example of fig. 2, a problem solving or computational exam question is edited. Such items present the student with a problem situation or task and require a demonstration of work procedures. The question states: Create a list of pairs {{degree Celsius, degree Fahrenheit}} for Temperatures Celsius from *'parameter 1'* (parameter 1 running from 10 to 50 in steps of 10) to *'parameter 2'* (parameter 2 running from 60 to 120 in steps of 10) with step *'parameter 3'* (parameter 3 running from 1 to 5 in steps of 1). The relationship linking degrees Celsius c to degrees Fahrenheit f is $f = 9/5 \cdot c + 32$. Write the output of your calculation to Mathematica

Figure 2a: The question preview. Each student sees a differentiated question.
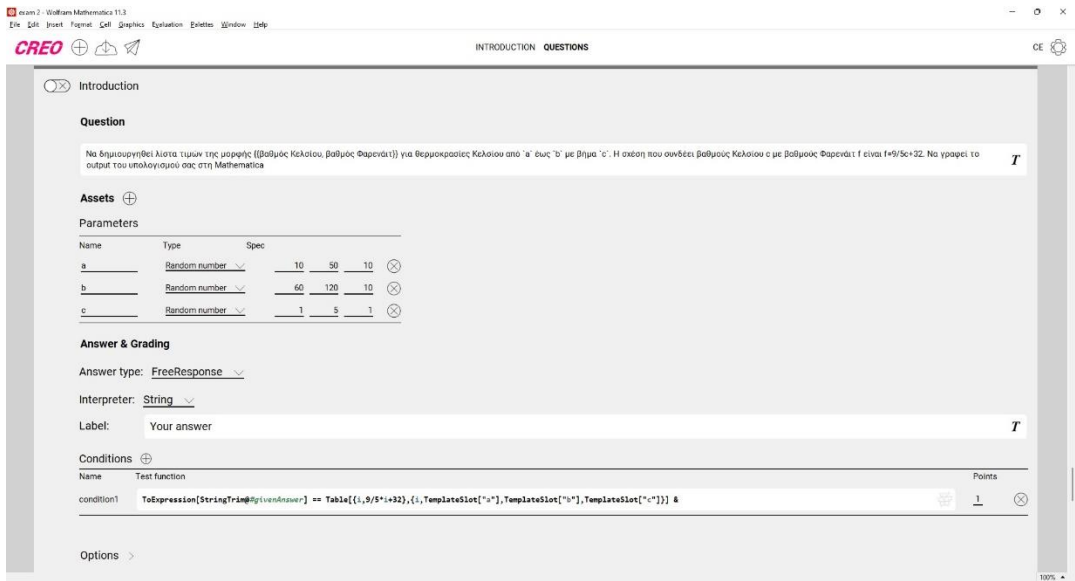
Figure 2b: The question setup in the authoring tool CREO. Coding is implemented in the Wolfram language.

Questions 3 and 4 that follow use parameters in both the wording of the question and in the pool of possible answers.

The next examples concern assessments of the time value of money. The question tests the implementation of the NPER function in MS Excel. The question in fig. 3 states: We want to calculate the loan repayment months of € 10,000 if the annual value (payment) is € *'parameter 1'* (parameter 1 running from 100 to 1000 in steps of 100) and the annual interest rate is *'parameter 2'*% (parameter 2 running from 1 to 6 in steps of 1). Select the correct answer from the options below.
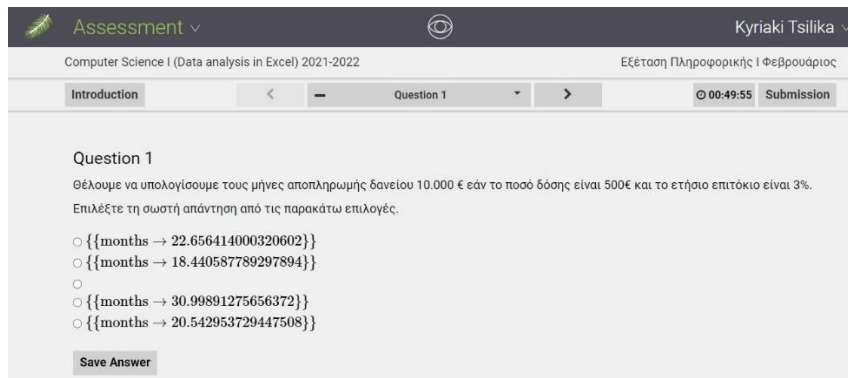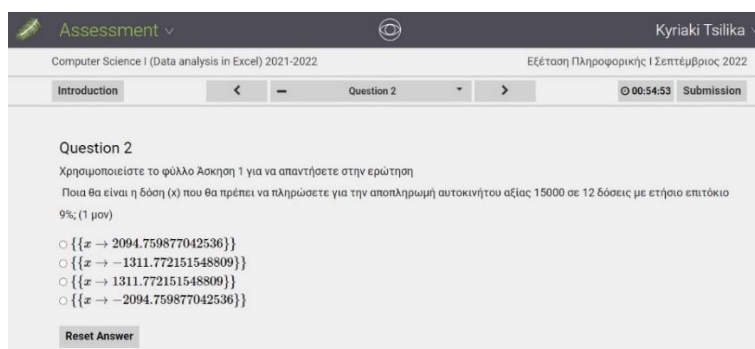
Figure 3a: The question preview. Each student sees a differentiated question and a different set of possible answers.
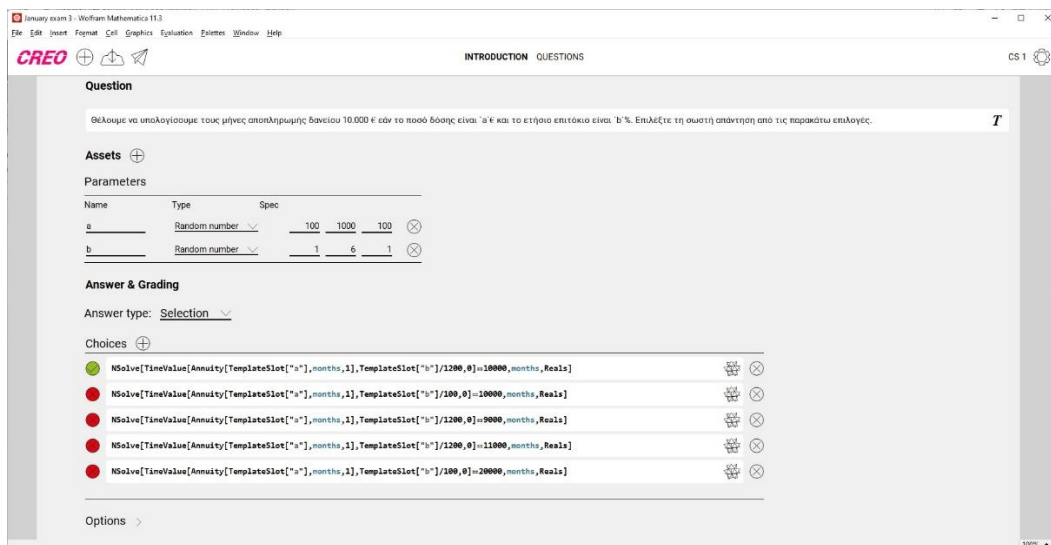
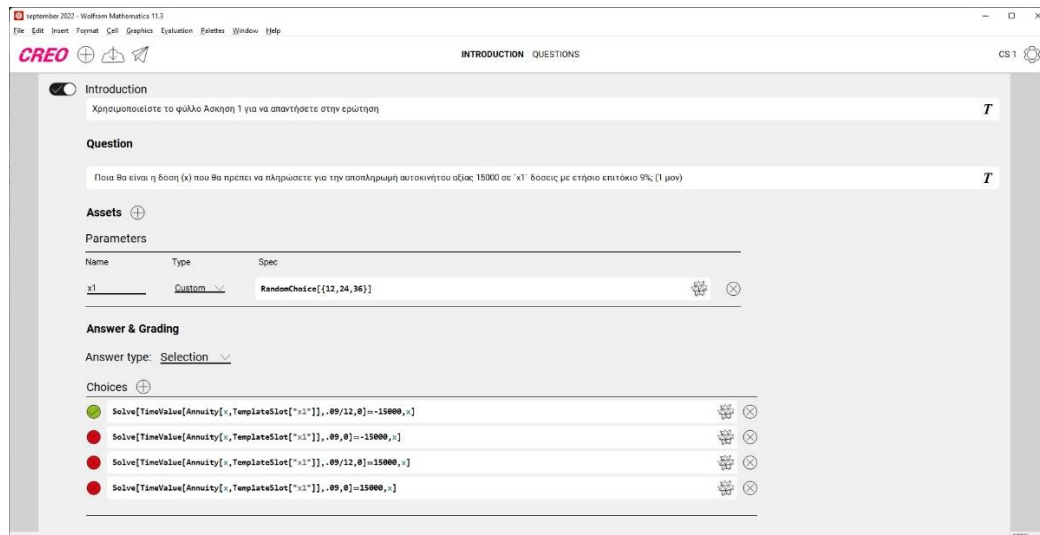Figure 3b: The question setup and the codes for the answers setup in the authoring tool CREO. Parameters are used in both the wording of the question and in the answers.

In the next item, students are tested on the implementation of the PMT function in MS Excel. The question in fig. 4 states: What will be the annual value (payment) (x) that you will have to pay for the repayment of a car worth 15000 in *'parameter'* payments (parameter∈{12, 24, 36}) with an annual interest rate of 9%?

Figure 4a: The question preview. Each student sees a differentiated question and a different set of possible answers.

Figure 4b: The question setup and the codes for the answers setup. Parameters are used in both the wording of the question and in the answers.

3.2 **Design and implementation of the interactive response feature**

The programming module for the interactive response feature is based on a single command, Manipulate, which output is an interactive object containing one or more controls that can be used to vary the value of the parameter list.

The question in fig. 5 states: If the demand function of the quantity Q of a good relative to the corresponding value P is $Q = 40 - 2P - P^2$, identify the elasticity of demand in terms of price when $P = 4$ using the slider
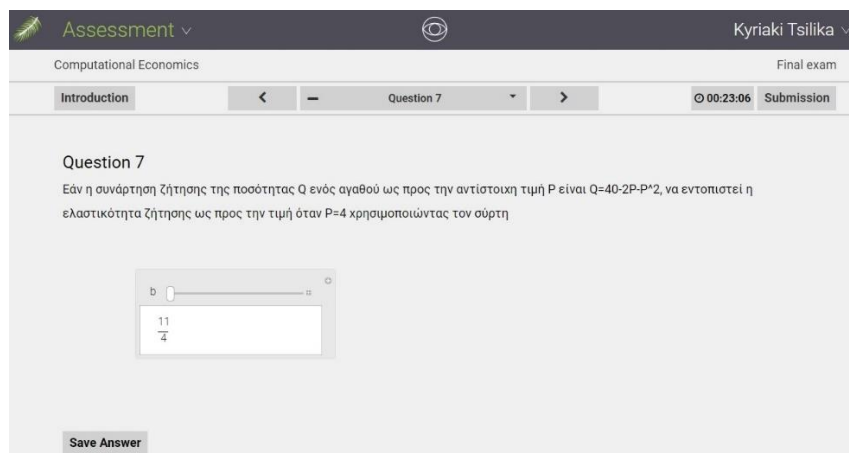
Figure 5a: The question preview. The student places the slider in the position of the value of elasticity
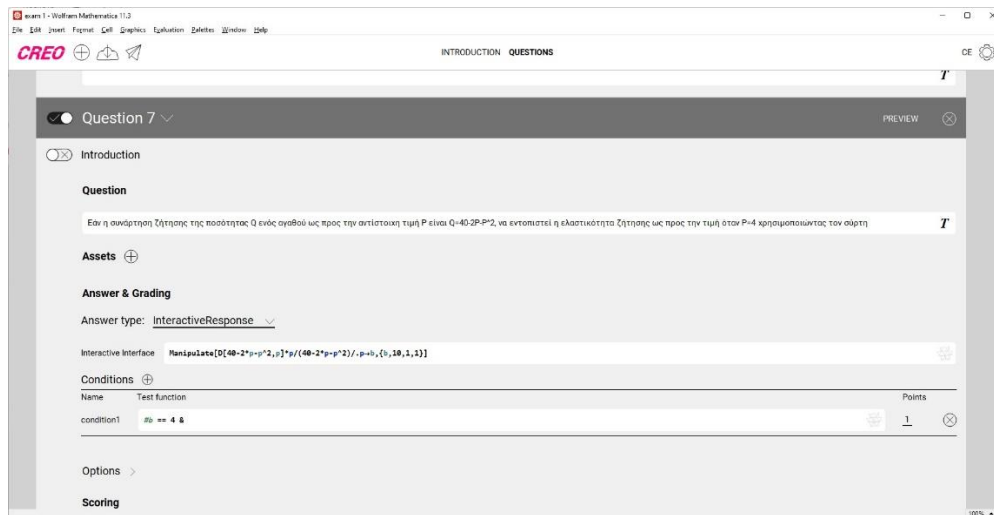
Figure 5b: The question setup in the authoring tool CREO. The programming
module was developed using Manipulate built-in *Mathematica* function

3.3 **Design and implementation of the selection question feature**

Multiple-choice questions are one of the most popular question types that present a question or statement with a list of possible answers. There are plenty of answer settings available to customize multiple-choice questions for an exam.

- Single or multiple solutions
- Shuffling of choices
- Choice Randomization
  - Random subset. This option allows to present only a specific number of total choices. It randomly displays a specified number of choices from the total choices available always including the correct answer (or a selected number of correct answers in case of multiple correct answers)
  - Advanced Randomization: This option allows to specify which choices are randomized and which are always displayed in the same location.
- Award points for both correct and incorrect answers (even negative points). The "additive points" option aims to discourage random guessing and succeeds fair grading in cases where points awarded should be according to students' decision for each choice.

The question in fig. 6 states: Consider the cost function $c(q) = 4q^3 - 12q^2 + 17q + 54$. Select the correct choice below, after graphical or numerical verification in Mathematica
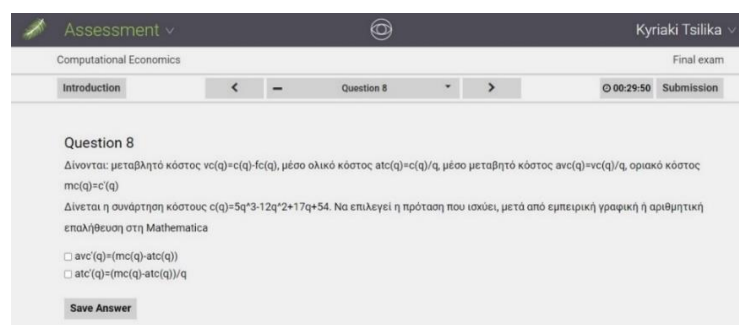

Figure 6a: The question preview. SYLVA provides a different view for each student

Figure 6b: The question setup in the authoring tool CREO. SYLVA provides each student with only 2 choices from the 6 possible answers including only 1 correct.

4. Key benefits of self-tests and exams in SYLVA

Several practical solutions that help to adapt examinations to remote online settings are suggested here. Relative advantages are stated from two views: a student view and an instructor view.

The student's interface contains some useful functionalities, such as a timer, access to any question of the exam in one click (fig. 7), smart notifications prior to and after submitting the test. This infrastructure enables remote instruction, brings increased efficiency, transparency, and time savings; the instructor may omit notification guidelines and needs not interrupt the exam.

The instructor, as the exam administrator, gives access to an exam test to a selected group of students (fig. 8). Students that are logged-in to the e-course but not assigned the exam, cannot access the test, and will see the notification "Exam Not Available". This functionality is particularly useful in cases of multiple examination groups.

For the creator of the exam content, the Wolfram Language is a full-scale computational language (Dakkak et al., 2020; Wolfram, 2019), that builds on clear principles and an elegant unified symbolic structure (https://www.wolfram.com/language/). Quantitative courses with contents containing symbolics, graphical representations (see indicatively fig. 9), and modules for algorithmic thinking and coding skills, are fully supported.

A strong comparative advantage for the benefits of students and for the benefit of the exam administrator, is, that even after the assessments are completed by students, it is possible to change the grading. The grading can be revised both before and after the publishment of the grades. After the instructor edits the changes in the content of a question or revise the points assigned to it, the assessment is instantaneously regraded.

Figure 7: An exam overview. Timer, questions quick access.

Figure 8: For distance exams (during the pandemic period) or for exams in the classroom in different groups/days. This option controls the group of students who see the exam.
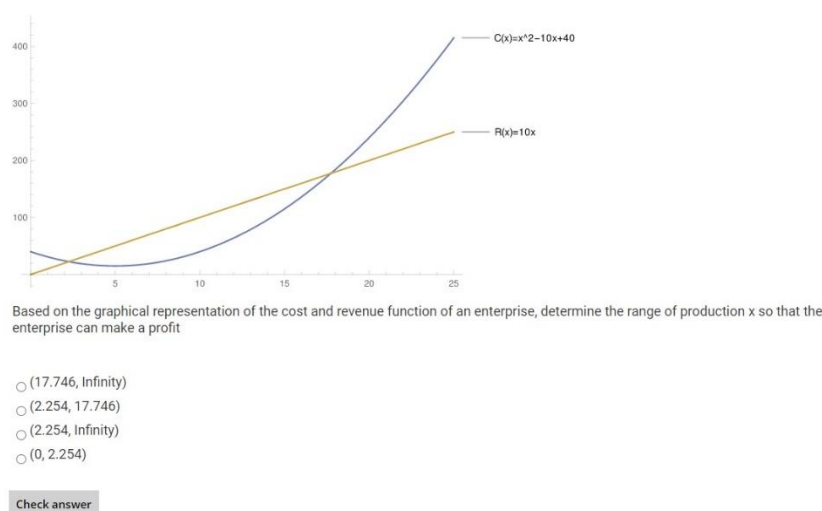

Figure 9: Preview of a question containing a visual element created in Mathematica

5. Conclusions

This study seeks to stimulate the exchange of experiences and good practices in online assessments for academic courses. It provides some directions for individual questions and integrated quizzes tailor-made for online and/or remote exams in disciplines with data analysis, mathematics, and computational thinking components. Controllers can choose between automated or manual grading, have access to automated course activity analytics, assign the exam to a chosen group of logged-in students and above all, add more insight into the structure and development of different questions of equal difficulty level.

Acknowledgments

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Student with disabilities, and online assessment

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Abstract

The online assessment (OLA) has been an important concern in Distance Education in the last decade, and is frequently one of the unique activities that are carried out as face-to-face in our universities. It is related to guarantee the reliability, confidence, and security of the processes. Several projects, researches, and publications have focused these questions. The last two years, and the pandemic requirements for assessment have multiplied the experiences, produced new proposals, and increased the research on this topic. We analyse the state of the art, lessons learned, and specific focusses to research for the best practices. We have interviewed teachers, and students to understand their point of view, to analyse their experiences, and to detect their fears, and expectations. Teachers greatly fear copying, plagiarism, impersonation, and communication among students. Meanwhile, students highlight the advantages, amenities, and facilities provided by online assessment systems. By way of synthesis, we provide a proposal that tries to mitigate the weaknesses of the system, and take advantage of its strengths.

Keywords: Postpandemic, University, Disability, Learning, Assessment.

1. Introduction

The recent pandemic brought about major changes in our ways of life. In the field of higher education, this extraordinary health situation forced the adoption of measures to ensure the continuity of academic life. One aspect that has been most affected is undoubtedly the evaluation system. The technology has proved to be a powerful support in meeting this challenge, both in on-site universities, and in those with a blended learning tradition. The National University of Distance Education (UNED) belongs to the latter type and, although teaching is carried out virtually through virtual means (mainly the Alf platform, and the Avip videoconference system), the pandemic has incorporated other tools such as Teams or Zoom. However, the UNED general assessment system had always been face-to-face, specially in the degrees. Students have to travel to the UNED centres to take the exams. The pandemic forced the teams that make up the technological centres to set up, in record time, an assessment system called the Virtual Examination Classroom (Avex), which allowed students to take their

exams without having to travel to the centres for this purpose, thus avoiding the consequent risk of contagion. Both students, and teachers had to adapt to this new assessment system (García Aretio, 2020). During the second semester of the 2019-2020 academic year, and throughout the 2020-2021 academic year, academic life at the university was able to continue with a certain degree of normality thanks to these technology-based solutions.

The assessment is a traditional topic for pedagogical researchers, trainers, and teachers (Pérez Juste, 1996); Oosterhof et al., 2008) emphasizing that it is one of the keys to ensure the learning, to improve the methodologies, and to increase the quality of training systems. It was already a frequent topic of concern in all the educational levels, and especially in the higher education (Challis, 2005; Centeno Brambila, and Lira Obando, 2014; Vera-Cazorla, 2015). The pandemic circumstances caused a broad application, and generalized the concern for the quality, the reliability, and the resolution of the problems caused by its use, sometimes in a very hasty, and unorganized manner (Rizo Rodríguez, 2020; Cabero-Almenara, and Palacios-Rodríguez, 2021; García-Peñalvo et al., 2021).

This seems an appropriate moment to reflect on, and analyse some of these changes in order to consider the possibility of integrating part of them on a permanent basis. As some authors point out, all these circumstances should be taken as an opportunity to undertake the required transformation of the schemes on which education is based (Barberá-Gregori, and Suárez-Guerrero, 2021). However, it is necessary to take into account the need to overcome some of the difficulties that have been highlighted in this process. As Bonilla-Calero, and Serrano-García (2021) point out, online assessment systems have exposed different issues such as the technological adaptation of resources for teaching teams, and students.

For all these reasons, we have been interested in knowing the perception of teachers on the one hand, and students on the other, to find out how they lived this experience and, in general, what they think of online assessment systems, and how they see the future of this system.

2. Research design

We have carried out a qualitative research approach based on interviews with 15 UNED teachers from different areas of knowledge, and 15 students from the same university, and from different disciplines studying Bachelor's, Master's, and Doctoral degrees. The teachers belong to disciplines such as Computer Science, Economics, Economic Theory, and Mathematics, Social Work, and Anthropology. The questions we asked the interviewees, both teachers, and students, were organised into different blocks of interest:

- Reliability of authorship, and fraud control tools in the online evaluation system.
- Risks of the online assessment system that may compromise the quality standards of the university.
- Advantages of this system in the case of students with disabilities.
- Difficulties of adapting the system to the contents of the subjects.
- Future of this system in terms of its chances of being sustained on a permanent basis, as well as proposals for improving the system as an opportunity for innovation.

3. Results

3.1. Reliability of the online assessment system, and maintenance of quality standards

In the case of Avex, the UNED had a biometric control system in place by randomly taking photos during the exams. Students were asked, upon informed consent, to keep the camera on during the whole time they were doing the exercise. We asked teachers, and students several questions related to reliability, and authorship guarantees:

- Do you think that the online assessment system may compromise the quality standards of the university?
- In view of the results, and taking into account the return to the traditional system in this academic year 2021/22, have you noticed any impact on academic results? Have more or less people passed?
- Do you think that the online assessment system has sufficient tools to guarantee the authorship of the exams, and therefore the guarantee of a clean, and fair assessment process?

When analysing the empirical material, we find different positions. Of the fifteen teachers interviewed, eight said that they did believe that quality could be compromised, while seven did not. There seems to be a common agreement on the need to extend the control systems for those cases in which the online assessment system is maintained. The most popular option is proctoring, a system used which consists usually of webcam monitoring throughout the examination. The problem they point out for the use of this monitoring system has to do with European legislation, as this technique could violate the right to privacy, and data protection laws. To mitigate these problems, one of the professors proposes peer assessment, a method used in some Mooc (Massive Online Open Courses) courses at universities such as Yale, Princeton, Harvard or Berkeley (Huisman et al., 2018). This method of online teaching consists of marking tasks, activities, or exams among peers, thus increasing the responsibility, and participation of students.

However, despite the preference shown for face-to-face assessment, all the teachers interviewed recognise that there will always be a percentage of students (around 0.5%) who will look for ways to cheat in an exam, regardless of the system used. One teacher confessed: "Even if there are eighteen of us on the examining board checking the exam, you can never guarantee that there won't be a student with a tiny earpiece getting help from outside". As Harmon, and Lambrinos (2008) state, more dishonest behaviour is neither observed nor to be expected in online assessment than in face-to-face tests. It would not be useful to focus on the issue of honesty, and reliability, but rather to provide pedagogical measures for students to develop the expected competences (Sangrá, 2020). In general, teachers did not perceive a higher number of passes with this system compared to face-to-face examinations. What they did observe was an increase in the number of students taking the examinations. As one of them states, it should be taken into account that during the pandemic there was more time available, and this meant that many took advantage of the occasion to dedicate themselves to their studies, and prepare the contents better.

The students' perceptions of reliability go in a different direction. Ten of them say that they felt that their honesty was questioned despite the control system employed: "I studied a lot because I had more time during the confinement, and when I did very well in an exam, I was left wondering whether the teacher would think I had cheated". In some cases, this generated some anxiety. What they fully agree on is that they should be combined with other assessment techniques so that the weight of the marking does not fall exclusively on a single test. Montejo Bernardo (2020) says, on this issue that worries students so much, that some teachers consider it "unfair" that students are doubted, but it seems that, in general, this feeling persists among teachers. One way to solve this problem would be not to focus on the qualification as the result of an exam but to take into account all the components of the educational project, or, as Rodríguez (2005) points out, to understand assessment as a process that, according to certain criteria, pursues the achievement of educational objectives in what she calls criterion-based assessment.

Another aspect unanimously pointed out by the students is the advantage of this system for reconciling work, and family life: "Thanks to the pandemic I was able to study, and get very good grades because, as I didn't have to leave home to work, I was able to make better use of my time". In other cases, the pandemic resulted in job losses due to company closures, which also led to this increase in the number of students enrolled in the 2020-2021 academic year. Regarding family, and student reconciliation, it is worth mentioning the work of Lozano Cabezas et al. (2016) that, from a gender perspective, analyses, and proposes the need to propose actions to alleviate the obstacles that motherhood may pose.

3.2. The online evaluation system, and accessibility guarantees

In this block we organise the issue of accessibility around these questions:

- Do you think that for students with disabilities the online assessment system can be an advantage in terms of accessibility?
- According to the characteristics of the subject you teach, do you have to make many adaptations in the exams in the case of those students who require it?
- Considering these students who require adaptations in exams, do you think that the online assessment system facilitates this task?

It should be noted that UNED is a university that prides itself on pursuing 100% accessibility. The implementation of OLA was an opportunity for many students with disabilities. The interviewed students with disabilities, especially those with mobility difficulties or visual impairment, even total blindness, see the online assessment system as an opportunity to continue their studies in a more accessible way. In the first case, because of the difficulties involved in travelling, to which architectural barriers must be added, and, in the case of visual impairment or total blindness, the online assessment allows the use of the adapted electronic devices that they handle usually. When we asked the teachers about this, they all agreed that OLA is an advantage for this group of students. They propose to maintain this system on demand. If the student has less difficulty traveling or are familiar with the exam center, they go to it to take the evaluation test through a platform system adapted to their needs, otherwise they are favorable to carry out the evaluation system online from their home or workplace with their support products. The

teachers make this proposal since it promotes the educational inclusion of the student and equal opportunities, by sharing experiences with their peers and with the examining board.

3.3. Digitalisation as an opportunity, and as a barrier

The teachers were asked questions about digitisation, and its limits in adapting content to digital tools. The intention was to find out to what extent the system was adapted to the contents of the subjects they teach, and the possible technical difficulties they had to face. The questions were as follows:

- What has been your experience with the online evaluation system implemented during the pandemic, and what transformations or efforts did this change in the evaluation process entail?
- For the type of subject that you teach, do you think that the online assessment system is sufficiently adapted to the contents, and assessment criteria?

Digitalisation is an undeniable fact. Most of our day-to-day management, and activities are mediated by the use of technology (Barberà, 2016, Blázquez et al. 2017). In education, even in face-to-face universities, a transformation took place during the pandemic that has left the problem of the digital divide on the table. All professors agree that technology offers a great opportunity for learning in all areas of knowledge, but this requires bridging the digital divide. Schwartzman argues that the return to normality continues to highlight the gaps in digital education, and that this can lead to the design of training models that generate inequalities, and controversies (Schwartzman et al., 2021). It is important to mention the demands of teachers in the area of basic sciences. Teachers of Computer Science, Economic Theory, and Mathematics demand specific software that facilitates mathematical notation. In some cases, they had to modify their exams because it was very difficult to write formulas or include graphs.

Some students interviewed point to the issue of the digital divide as one of the reasons why OLA could jeopardise reliability. They argue that the more computer literate they are, the more likely they are to commit exam fraud. Others complain about the cost because OLA requires devices capable of adapting to the technical demands of the system. Some students who, because of their age, are not proficient in the use of technology, are reluctant to take online exams because they fear that they will not be able to handle them. What they all agree on is the fear of being disconnected or the line going down while they are taking the exam. In the case of the UNED, there are students who live in rural areas where they still do not have good Internet connections, which makes the task more difficult, and increases anxiety.

4. Conclusions

The main conclusions we find are:

- The online assessment system can be viable as long as it is combined with an integrated, and formative continuous assessment that is not only focused on the completion of a test, but on a process throughout the learning period.
- The exams cannot consist of memorising content, but requiring reflection, and reasoning relating different concepts. Thinking rather than memorising.

- There is agreement among teachers on OLA demand as an alternative for students with disabilities or special circumstances that are sufficiently justified. Two alternatives could be considered: Taking the test online at the center or at home depending on the mobility difficulties and ease of adaptation of the system to the needs of the student. This solution could contribute to achieving full accessibility. Many students with disabilities choose distance learning universities because they are best suited to their needs. Face-to-face examinations can be an obstacle for those with mobility difficulties or who need highly adapted equipment.

- Regarding the reliability of the online assessment system, it is essential to extend the control systems that guarantee the authorship of the assessment tests. Teachers who set examinations with reasoning, and development questions in their subjects are in favour of maintaining the OLA in combination with continuous assessment, and other assessment techniques such as forums, teamwork, and peer assessment. In any case, ethical, and legal issues need to be addressed.

- Honesty, professionalism, and rigor should be curricular content so that students develop values, acquire knowledge, and conduct themselves in accordance with the code of ethics of the professionals for whom they are being trained.

- The use of tools such as Teams or Zoom that allow videoconferencing in which teachers can assess students with sufficient guarantees of reliability, at least in those cases in which the student, either because he or she has some degree of disability or for some other duly justified reason that prevents him or her from travelling to the examination centres.

- The video call also allows teachers, and students to keep in contact with each other in order to provide guidance, clarify doubts or solve problems during the session.

- Peer assessment is proposed in order to involve the students themselves in the assessment process. It consists of a student correcting the work of another student, according to previously established criteria. This method is used in Mooc courses.

In conclusion, the future of online assessment depends in any case on improvements, and innovations that affect the entire education system. Specifically, the pandemic has brought the crisis of the evaluation system to the surface. Changes are called for, and transformations are needed.

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Recognition and Qualification of microcredentials, short learning programmes and MOOCs

Making Microcredentials Count

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Abstract

The popularity of microcredentials across Europe is growing fast. They have the potential to become standard provision of learning for professional development or personal growth because they provide standalone chunks of learning that can deliver up to date knowledge and skills timely and flexibly. The 'micro' in the name addresses these benefits. The notion of credit in the 'credential' part of the name is less clear. The adoption of European-wide standards within a widely accepted framework for microcredentials helped to raise the currency of this learning opportunity independent of quality accredited learning providers such as universities. How the credits from these microcredential can be brought back into traditional higher education is less developed – few institutions have found solutions for integrating microcredentials within their qualifications. This is not for lack of interest or trying.

The Open University, United Kingdom (OUUK) established a microcredentials programme in 2019 with the aim to reach new and different learner populations in new curriculum areas as an alternative to the university's standard 30 and 60 UK credits 'core' modules provision. The Faculty of Wellbeing Education and Language Studies (WELS) presented two of the first pilot microcredentials in 2020, including HZFM881 – Online Teaching: Creating Courses for Online Learners, a 15-credit postgraduate module, created in six weeks as a response to the COVID-19 pandemic. WELS now have a portfolio of nine microcredentials, with a further nine in the pipeline.

What is less clear is how the development of microcredentials can become something that universities simply do alongside their core provision of module and qualifications. What quality assurance standards need to be in place that can assure the quality of the learning experience but that remains true to the 'spirit' of bite-size, timely and innovative professional and personal learning. And finally, how can credits at undergraduate and postgraduate levels be integrated into existing qualifications? What would it take to offer a university degree, consisting entirely of microcredentials? The paper will address these questions and present the processes WELS and the OUUK put in place to make microcredentials 'business as usual', sometime in the future.

Keywords: microcredentials; stackability; integration; continuous professional development.

1. Introduction

The Open University is the largest University in the UK (OUUK) and operates across the four nations of the UK, Ireland and worldwide. Our mission is to be 'open to people, places, methods, and ideas'. Through an open-entry policy, we promote educational opportunity and social justice by providing high-quality university education to all who wish to realise their ambitions and fulfil their potential. Through academic research, pedagogic innovation, and collaborative partnership we seek to be a world leader in the design, content, and

delivery of 'personal open and distance learning'. OU students are an extremely diverse group, and different from the sector.

This paper explores the experience of one faculty at the OUUK of launching a suite of microcredentials on the FutureLearn platform. The first author is the Academic Lead for Microcredentials in the faculty and the second author is the institutions' Academic Lead for Assessment and led the policy changes needed for integrating microcredentials into the university's core curriculum. It will explore the unique context of OUUK, discuss the politics of the launch of microcredentials, the operational governance challenges and the university academic quality governance procedures needed to enable the faculty to launch this new curriculum product.

2. Context

The OUUK covers the four nations of the United Kingdom. It has four faculties with central and regional staff based in Milton Keynes and in offices in Belfast, Cardiff, Edinburgh, Manchester, and Nottingham. The Faculty of Wellbeing, Education and Language Studies (WELS) has over 400 members of central and regional staff and over 1,100 Associate Lecturers who support approximately 45,000 students. The majority of these are in the UK, but the faculty also has students in the Republic of Ireland, Continental Western Europe and elsewhere in the world. The faculty's curriculum comprises programmes at undergraduate, Masters', and doctoral levels.

The faculty is organised as three Schools:

- School of Education, Childhood, Youth and Sport (ECYS)
- School of Languages and Applied Linguistics (LAL)
- School of Health, Wellbeing and Social Care (HWSC)

Each school has a Senior Management Team (SMT) comprising a Head of School (HoS), Associate Heads of School with portfolios appropriate to the individual school's needs (AHoS) supported by professional services colleagues. The SMTs are supported by Associate Deans in Curriculum, Teaching Excellence, Research and Knowledge Exchange and their deputies.

The OU launched FutureLearn, a social learning platform, in December 2012 with a dozen UK university partners to test opportunities offered by digital learning and massive open online courses (MOOCs). In WELS we have delivered MOOCs on FutureLearn in subjects from Childhood in the Digital Age, Spanish, Italian and German as well as many others on our own OpenLearn platform. In 2019 the OUUK established a microcredentials programme with the aim to reach new and different learner populations in new curriculum areas as an alternative to the university's standard 30 and 60 UK credits 'core' modules provision. In 2020 the OUUK appointed a Managing Director, Paid Short Courses & Microcredentials (MDPSCM) who established a Microcredentials and Short Courses Unit (MSCU) which oversees the development and delivery of content for FutureLearn including our Microcredentials offer.

This work is essential to the university, in particular for meeting one of its five strategic goals:

greater reach, offering unrivalled choice, quality, and flexibility to more people from all parts of society through a range of channels and learning opportunities, with the University's core offer of qualifications and accredited learning at its centre (The Open University, 2022c).

3. The Politics of Microcredentials

Whilst the popularity of microcredentials across Europe may be growing fast and at an institutional level Higher Education Institutions (HEIs) may identify their role in meeting their strategic goals as identified above, there

is not necessarily general buy-in from the academic community. Furthermore, there is a lack of consensus regarding the purpose and place of Microcredentials in reference to or alongside what might be considered core curriculum.

In WELS we identified three main areas of contention in launching microcredentials for academic staff:

1. Microcredential production in relation to 'core' curriculum
2. The commissioning model adopted by OUUK
3. The pedagogy of microcredentials on FutureLearn

3.1   Microcredential production in relation to 'core' curriculum

Reservations have been raised even from academic colleagues who are generally very positive about innovation and happy to be early adopters. The first of these can be broadly defined as 'learner experience'. This can be defined firstly as a perception that one group of students will have a 'lesser' experience. The former belief is somewhat reinforced by the fact that the university articulates a difference between OUUK students on our core curriculum by identifying them as 'Students' whereas those studying our microcredentials are considered 'Learners'. Furthermore, it is true that our microcredential learners do not have access to all the resources that our students do. However, the point has been made that the needs of microcredential learners are different from our students. Demographic learner insights from FutureLearn tell us that learners are more likely to be professionals, most likely already with an undergraduate degree or even a master's degree. Microcredentials provide an opportunity for individuals looking to change or progress their existing careers or respond to rapid changes and demands for new skills as their industry evolves. As such, both microcredentials and their learners in some ways are worlds away from our traditional student who may well be an adult, without undergraduate qualifications and who are often seeking to address a lack of educational opportunity earlier in life. At any rate, traditional OU students' study for qualifications and microcredentials learners' study individual courses.

The second aspect of 'learner experience' that concerned colleagues was the notion that expending resource on new curriculum products will take away resources from current students. As the development of microcredentials was of strategic importance to the university the funding for this work was ringfenced, meaning that it could not be allocated to core curriculum. Therefore, if the faculty had decided not to produce microcredentials we would not have had access to this funding and furthermore, access to the learning opportunities created, for both learners and educators, of producing microcredentials on the FutureLearn platform. A process that has enabled us to reflect on and improve some aspects of our pedagogical approaches in our core curriculum such as changing the positioning of student forums to promote student engagement.

3.2   The commissioning model adopted by OUUK

The second contentious issue is the commissioning model chosen by OUUK. As outlined above, the OUUK established a Microcredentials and Short Courses Unit which manages the relationship between the academic communities in faculties and FutureLearn. The funding for microcredentials is ring fenced and the Managing Director, Paid Short Courses & Microcredentials has responsibility for the strategic direction of the development of microcredentials. Due to their need to support addressing sector skills gaps and responding to rapid changes in industry the university has taken a market driven approach to identifying potential curriculum areas rather than taking the lead from academics. This has sometimes created issues where we did not have the correct academic expertise in the institution to write the new microcredential that the market needed. This led to a mixed approach to production: in some cases, Faculties employed consultants and we have extensive experience with these models as we frequently employ academic consultants to contribute to

our core teaching. In some cases, Faculties decided to upskill their core academic staff to write for microcredentials, who then go on to oversee and support other academics or consultants in the production of future microcredentials. This way, the pedagogical and practical expertise can snowball across disciplines and programmes just as it did when the Open University developed its core curriculum open supported distance education model which the university is widely known for.

The market driven approach can also suffer from being reactive to what other providers are doing and following market trends. It may then not capitalise on our capacity to create *new* markets based on the knowledge and expertise of OU academics in their fields. This tension is perhaps inevitable and needs continued negotiation and fine tuning which may well be addressed in the current strategic review of Microcredentials by the Microcredentials and Short Courses Unit.

3.3   The pedagogy of microcredentials on FutureLearn

The third contention is about the overall pedagogical approach of Microcredentials on FutureLearn in contrast to the established Open University core provision of modules and qualifications. The 'OU-way' is widely recognised for its quality in assessment, teaching and student support. This quality is a result of continuous adaptations following major technological and cultural changes over the last 50 years. This included the switch from live TV broadcasts to recorded media (VHS, audio cassettes, CDs and DVDs during the 1980s and 1990s, the use of internet websites and learning management systems for our modules since the early 2000s, and the use of computer-mediated conferencing (synchronous and asynchronous) over the last two decades. Alongside, models for tutors supporting students through marking and feedback, tutorials and general student contact adapted to changing needs and technologies that allowed for ever greater refinement of what it means to teach and learn at a distance. Tutor groups of typically between 15-25 students per tutor group (more or fewer depending on subjects and disciplines) are at the core of the OU's teaching model, and National Student Surveys and External Examiner reports repeatedly confirm the high standards of teaching and learning on typically 30 or 60 UK credits modules (15 or 30 ECTS). Add to this the extra support for example through alternate formats or extra tuition for (a) students without the usually required entry qualifications (34% of students had just one A-Level or none of the three A-levels required for mainstream HE entry), (b) over 36,000 students with declared disabilities, or (c) students studying in over 150 prisons and 50 secure hospital environments (2020/21 figures (The Open University, 2022a) and it is easy to see how academic colleagues have become proud and protective of their modules and qualifications.

Contrast this to the leaner model of teaching and learning on microcredentials for which a Common Microcredential Framework (CMF) was launched in 2019 by the European MOOC consortium (European MOOC Consortium, 2019). The Framework guarantees minimum standards that eventually allow for 'eclectic' qualifications, i.e., students combine their credits from microcredentials towards qualifications at undergraduate or postgraduate levels, subject to the regulations by the awarding institution. Minimum standards assure a degree of portability that would otherwise not be possible. Minimum standards do not say anything about the quality of a course which is the responsibility of the provider institution. It does not mean a lesser experience either. It does mean that the level of tuition support such as the student-tutor ratio is different, that assessment and feedback may be more automated than in many OU core modules, and that the support for students with additional needs may not match the high standards of OU core as described above. In short, microcredentials are a different learning 'product' that facilitates learning in a different way based on a different pedagogical design. Quality monitoring by the provider institution will ensure that the learning experience meets the required standards, which is what quality monitoring also does for the traditional HE modules and qualifications.

Higher Education institutions that seek to broaden and diversify its learning offer to short courses such as microcredentials, will need to navigate the different pedagogical models and learning cultures. As we have experienced in our institution, there has been a tendency to try and make microcredentials more like OU core, just shorter. This is understandable but not sustainable in terms of resourcing, nor desirable in terms of the pedagogy for these courses. The challenge, in our case, is to take 50 years of experience in delivering quality in distance education and adapt it to genuinely new ways of learning. Campus based universities face the challenge to translate successful classroom practice onto a microcredential platform like FutureLearn.

With challenges come opportunities: microcredentials forced us to rethink our production models, for example the time needed to produce a new course. We expect that, in time, this will influence how we approach OU core modules. Shorter microcredentials may also allow us to test and learn new curriculum (and fail fast if need be) which is not possible in our standard production model with the lead in times and the comprehensive learning support described above.

4. Operational Governance

To launch a new curriculum product at OUUK that remains true to the 'spirit' of bite-size, timely and innovative professional and personal learning within Faculty of WELS we established the WELS Microcredentials, Expert Tracks and Short Courses Working Group. This group supports the three schools, secures faculty resource, and acts as a central conduit between Faculty and university, both learning and adapting to a new product and its potential to support flexibility in accredited learning (Kydd et al., 2003). The key aims, and responsibilities of the WELS Microcredentials, Expert Tracks and Short Courses Working Group are to:

- bring all discussions regarding prospective production plans for WELS on FutureLearn into a monthly decision-making forum, where each will be deemed ready for commission, requiring further development, or declined
- consider and agree the appropriate delivery model for each production plan i.e., Microcredential, Expert Track, short course
- define and agree faculty priorities for FutureLearn production
- monitor the progress of faculty products in production for FutureLearn
- evaluate and review processes and procedures
- review regularly the faculty's portfolio on FutureLearn

The remit of the group is broader than just microcredentials as they are responsible for all our short courses curriculum, including those that sit outside the focus of this paper. In establishing this group, we have identified three key areas that we would like to highlight.

Ways of working: One significant reflection on the launching of microcredentials in WELS is the importance of thinking about ways of working (Thompson, 2006) when bringing together different units with ostensibly similar priorities but where there are fundamental cultural and procedural differences. The approach adopted in WELS was informed by the first author's experience of leading collaborative working in the voluntary, community and statutory sectors (Conradie & Golding, 2013). On arrival at the OUUK, the MDPSCM took some time to orientate themselves to the institution and the work and the WELS Microcredentials, Expert Tracks and Short Courses Working Group was paused to support this to happen. When the work and the group was relaunched, a co-chairing model was adopted between the MDPSCM and the faculty lead, in this case the Deputy Associate Dean, Curriculum. This approach was adopted to foster a sense of shared collective responsibility and partnership across the two units (Boydell & Rugkåsa, 2007). It created a shared mandate to make things work including co-owning agenda setting. Furthermore, it created open and proactive

opportunities to discuss the priorities of the partners. This was particularly important as the PSCMU are an agile team established to positively disrupt the institution, whereas the faculty has a very different culture and planning cycle. For example, the faculty has an annual planning cycle for staffing and core modules can take over two years to produce, whereas the PSCMU can support the delivery of microcredentials in as little as six weeks.

This co-chairing approach has enabled us to coordinate our planning and resourcing across our three schools and professional services team and has been broadly successful thus far with the faculty having nine microcredentials in the pipeline for 2022/23 with five in the pipeline for the other three faculties. This will double the number of microcredentials that we currently offer, which is nine. However, there were not just two units coming together to produce our microcredentials. At the OUUK we work with our Learner and Discovery Services (LDS) to produce our core curriculum. So, it is standard practice for us to work with LDS colleagues from the initial inception of an idea to the first presentation of a module, with dedicated teams within LDS focussed on delivering the best possible learning experience for our students. Inevitably we have various structures in place to ensure that teams remain on track and communication remains open. In focusing on the support for and inclusion of the new PSCMU we were not as inclusive in our approach to working with the colleagues that we already knew and so as we continue to support the 2022/23 pipeline, we will be putting in place the safeguards that we have in core curriculum in microcredentials as appropriate. So, just as we have adopted good practice learned through our microcredential product to improve our core offer, we are ensuring that good practice in our core offer informs our ways of working to produce microcredentials.

The second key learning for us, both institutionally and as a faculty is that there is no one way to operationalise the production of microcredentials, and in the remit of our working group, short courses generally. In another faculty at OUUK they have a lecturer who is leading solely on their response to microcredentials. In WELS we have found that the working group was needed to coordinate the faculty's strategic decisions to support our short courses offer generally, including microcredentials. As such, microcredentials are part of the range of CPD and lifelong learning (LLL) opportunities offered by universities (Swain & Hammond, 2011). As we developed a broader curriculum in terms of product as well as content it became clear that one size doesn't fit all, and different curriculum products do recruit differing audiences. As we have developed our short courses offer across WELS the importance of the right curriculum product for the right learning experience has become key to good decision making.

We have also needed to adopt a differentiated approach across our three schools in terms of the types of short courses they prioritised. This was informed not only by the market-based commissioning approach as discussed, but also to support the three schools to meet their different strategic objectives. For example, there were a range of microcredentials identified as important CPD offers within the education programme in ECYS, and they were interested in working towards accepting them in their Master's in Education. Whereas the other schools prioritised other short course production.

Finally, the WELS Microcredentials, Expert Tracks and Short Courses Working Group provided a central space for staff across the faculty and other relevant units in the university to share practice, remove barriers and most importantly creating a learning community (Wise et al., 2012). It has also become a space for transparent decision making where all parties can represent their own challenges and priorities and consensus can be created.

5. Academic Governance

The award of credits for learning are UK-wide defined in several qualification frameworks, which are set out in detail in the opening pages of 'Micro-Credentials Characteristics Statement' (QAA, 2022), the most recent publication by the UK Quality Assurance Agency (QAA) from May 2022. The Statement acknowledges the difference of microcredentials from traditional Higher Education offerings, including that they are standalone products with a stronger employment focus driven by industry need; their role for up- and re-skilling of the workforce and their potential for widening access to higher education. The document also lists some of the challenges for integrating Microcredentials within traditional HE qualifications. These include the conditions under which credit can be counted towards qualifications, the maximum number of credits allowed for each qualification type (e.g. Bachelor or Master degrees), the shelf life of each course, the mapping and suitability of Learning Outcomes, the different student experience and what providers need to tell students from the outset, and, more generally, all the processes that need to be in place to ensure quality standards are met.

As quality assurance remains a matter for the provider, there needs to be a fine balance struck between the processes for quality assurance that institutions have in place for their traditional provision (referred to as 'macrocredentials') which can be complex and 'heavy-handed', and the need to maintain the flexibility and portability that Microcredentials can bring to Higher Education. While 'stacking' Microcredentials towards a qualification needs to be a feature in the integration process, this also poses challenges "as the simple act of credit-counting has never been an acceptable proxy for acquiring a recognised qualification" (QAA, 2022, p. 11).

This 'simple act of credit-counting' has however been a hallmark of open and supported distance learning at the Open University UK ever since its first student enrolled on a course in January 1971. Their only degree option then was the Open BA/BSc Degree. A quarter of a century later, named qualifications were introduced with increasingly tighter defined pathways over the years, but the Open Degree has remained one of the most popular degrees on offer. At its core, the OU Open Degree demonstrates a measure of trust in the student, that they, on the whole, make sensible decisions – and there is support available to help with this process. The website states proudly: "The BA/BSc (Honours) Open is a degree with a difference. Free from the restriction of a subject-specific specialism, you can set the direction of your learning" and quotes Open (Honours) graduate Carol Dow: "The fact that the OU has the option of choosing an Open degree is fabulous. So many people I have spoken to wish they'd had this option at university rather than going down one route" (The Open University, 2022b).

Credit transfer policies are also well developed, including, more recently the recognition of prior experiential learning. In 2021, 11% of students completing a named degree had some credit transferred from another recognised provider. For the BA/BSc (Honours) Open, that percentage rises to 48% (RPL Annual Report, 2022, internal and unpublished). The Open University, with their Open Programme and over 250 modules over 16 subject areas, therefore, already meets in some measure the policy drivers for microcredentials, namely:

> "the opportunity they provide learners to take control of their engagement with education, selecting short courses as and when they want, and on focused content that quickly delivers knowledge and skills. Some learners may find that this meets their needs sufficiently. There could be others, however, who would value the opportunity to build a series of micro-credentials into a recognised qualification, particularly those who do not currently hold a higher education qualification and might find that some employment opportunities are closed to them for that reason" (QAA, 2022, p. 12).

Academic colleagues at the OU realised soon that microcredentials could become an important element in support of the university's strategy 'Learn and Live' (The Open University, 2022c) most directly towards the goal 'greater reach', but in some measure also the goals 'success for our students', 'societal impact' and 'equity'.

The existing credit transfer framework allows the university to count credits (including Microcredentials) from other providers, subject to the usual checks regarding levels and learning outcomes. Credit transferred-in is unclassified and does not count towards the final qualification classification. This route is not available for microcredentials offered by the OU, colleagues discussing this in the relevant governance committees soon realised that credit awarded by the OU should always count, no matter if awarded for our core modules or our microcredentials, and also count towards classification of undergraduate and postgraduate degrees. Over the last two years, nine 'Principles for Microcredential Stackable Qualifications' have been approved through governance. They are listed below, with short explanations only for some principles for space reasons here, but also because many are self-explanatory, despite the lengthy discussions that preceded them (for further details contact the authors).

1. Microcredentials follow OU academic governance approval processes and quality assurance requirements in line with all credit-bearing OU curriculum.
   This principle addresses the overall quality assurance concerns for the design, production and delivery of Microcredentials. Operationally, these courses are scrutinised by subject and quality assurance experts prior to their passage through governance committees. This allows for more speedy processing and great flexibility outside the institutional governance cycle.

2. Those studying on FutureLearn microcredentials should be referred to as 'learners' to distinguish them from OU students on OU standard modules and qualifications and from apprentices.
   This addresses the different student experience and pedagogical model and allows for clearer communication to students and staff. It also aligns with the QAA terminology (QAA, 2022).

3. OU microcredentials must align with the latest version of the Common Microcredential Framework (CMF) agreed by the European MOOC Consortium.
   This ensures portability across institutions in Europe and elsewhere and may deliver the spirit of the Bologna Process in ways not fully realised with traditional HE provision.

4. Microcredentials should align with a single pre-approved model for assessment and tuition delivery.
   This is potentially a radical step towards simplified assessment design across subjects and it keeps the approval process lean. The more important task for academic colleagues is to devise modes of assessment that meet criteria for good assessment such as those outlined in the JISC report on the Future of Assessment (Jisc, 2020).

5. OU microcredential credit is OU credit and may be counted towards an OU qualification and may be used within the qualification classification.

6. OU microcredentials can be counted towards an OU qualification provided the established principles, frameworks and policies are followed.

7. OU microcredential stackable qualifications and the constituent microcredential modules will follow the first six Principles of the Academic Framework for Microcredentials.

8. OU microcredential stackable qualifications will align with the OU Qualifications Framework and associated policies.

9. The maximum total credits for an OU microcredential stackable qualification (i.e., where a qualification is comprised wholly of microcredentials) is 120 at undergraduate and 60 credits at postgraduate.

The last principle, referring to qualifications 'comprised wholly of microcredentials' points to unfinished business. The Open University is currently piloting a Postgraduate Certificate in Academic Practice (PGCAP), delivered by colleagues in the Institute for Educational technology IET with the School of Education, Childhood and Youth Studies. It consists of four 15 credit Microcredentials, chosen by the learner from a suite of currently three core microcredentials and an option to study one of three optional microcredentials, with potentially many more in the future. It is part of an MA in Online Teaching and within that qualification covered by the nine principles. As a standalone PGCAP, we need to discuss further issues around verification and invigilation that have also been raised in the MCCS (European MOOC Consortium, 2019). One solution put forward there, to add a capstone assessment that would evidence the learning on any of the Microcredentials chosen by the learner, may be a way forward for the Open University. More discussion will be needed but it is safe to say that Microcredentials are here to stay and that, in time, they will be fully integrated in our qualifications.

6. Conclusions

To conclude, launching microcredentials in our faculty and university has not been without its challenges. However, through a pan university collaborative approach, supporting a dedicated Paid Short Courses & Microcredentials Unit we were able to draw upon the experience of some very knowledgeable OUUK colleagues. Together with innovative colleagues new to the university we have been able to not only reach a significant number of new learners, but also support them with bite-size, timely and innovative professional and personal learning.

Whilst there is clearly further work to do to fully integrate microcredentials into our qualifications, we have made significant inroads. What we have seen thus far is how microcredentials have supported us to meet our current university strategy (The Open University, 2022c) and will support us to continue to innovate and respond to the needs of learners and employers by offering flexibility, choice, and providing a range of opportunities to support lifelong learning.

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Recognition of Prior Experiential Learning (RPEL) on Entry to UK Degree Apprenticeship Programmes: Potential and Problems

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Abstract

When considering degree apprenticeships, Recognition of Prior Experiential Learning (RPEL) has the potential to provide an accessible entry route into higher education (HE). However, there is evidence to suggest that offering RPEL on entry to degree programmes is far from simple to accomplish (Peters, 2006; Singh and Ehlers, 2019). As higher education institutions tend to have established definitions of knowledge and what is valued in learning (Valk, 2009), questions arise regarding how RPEL is offered, and whether there is sufficient incentive and support for apprentices to consider an RPEL entry route.

The approach taken to the research is predominantly a qualitative ethnographic case study. Initial data collection took the form of review of UK apprenticeship policy documentation and RPEL guides. A series of interviews with those involved in putting RPEL policy into practice, involving both academic and academic-related staff, gave further insight into the RPEL processes. The final phase engaged the apprentices themselves in order to gain further insight into their experiences of RPEL. Data were analysed using thematic analysis, in order to build a rich narrative from multiple perspectives.

Initial findings suggest that RPEL can be more problematic than RPCL (Recognition of Prior Credited Learning) to implement when trying to bridge the gap between academic study and what has already been learned in the workplace. It can be difficult to determine how a varied range of prior learning can best be matched to relatively large academic modules. Verification for RPEL can also be extremely challenging. However, RPEL has the potential to save apprentices time and effort by appreciating the skills they have developed in the workplace. The is the potential to incorporate Short Learning Programmes (SLPs)into degree apprenticeship programmes as they can be adaptable to learner and employer requirements (Dunn, 2019). Recognition could be gained via short microcredentials, providing a flexible route within formal degree education. (Cedefop, 2017; MOONLITE, 2020).

The research has the potential to contribute to professional practice by uncovering the reality of degree apprentice RPEL opportunities and barriers by hearing the voices of the stakeholders involved in the process. Ultimately, the aim is to create opportunities to move towards an inclusive model of recognising prior experiential learning in the arena of degree apprenticeships.

Keywords: recognition of prior experiential learning, assessment, apprenticeships , micro-credentials

1. Introduction to the research

The research explores the opportunities, and challenges, associated with recognition of prior experiential learning (RPEL) on entry to UK Higher Education (HE) apprenticeships at the Open University (OU). Recent legislation demands that RPEL is available (IfATE,2020), as UK government funding for apprenticeships excludes components such as applicable work experience, prior education, training or associated qualifications. In addition, the aspiration underlying the development of degree level apprenticeship programmes is to offer opportunities for development of existing skills, relating to wider government-led goals such as widening participation and progression (UK Parliament website, 2019). The implication is that apprentices should have an opportunity to build on such skills and gain academic recognition for such learning, for which RPEL is an ideal vehicle.

To differentiate between recognition of prior learning (RPL) and recognition of prior experiential learning (RPEL), RPL is an umbrella term for accreditation of credit transfer, experiential, or non-formal learning, and is a process for "assessing previous learning that has occurred in any of a range of contexts including school, college and university, and/or through life and work experiences" (QAA, 2018, p.31). The credit or exemption can be used towards academic qualifications, or career development and, within HE, RPL can be implemented via formal transfer of Credit Accumulation and Transfer Scheme(CATS) points between universities for academic accreditation. CATS points are only counted for a complete module or modules, so there is a limitation on the extent to which accreditation is applied. In contrast, RPEL specifically focuses on experiential learning (Kolb, 1984), and has the potential to offer additional flexibility and opportunities for entry into HE for those from a wide range of educational backgrounds. One such group for whom this is appropriate is degree apprenticeship applicants.

As apprentices are in work, sponsored by their employer with a range of work-based experiences, RPEL entry is particularly relevant. There is very little research into RPEL processes for UK HE apprentices, yet the wider literature suggests that restrictions on RPEL in various contexts is an enduring and ongoing issue across HE in general (Peters, 2006; Singh and Ehlers, 2019). Questions arise regarding how RPEL is implemented and presented, and whether there is sufficient incentive for applicants to consider an RPEL route into HE . In addition, the availability of guidance for applicants is not standardised, so support mechanisms can also be called into question (Harris, Breier and Wihak, 2011). What should be an open, inclusive accreditation policy could in fact be very restrictive.

There is an opportunity for RPEL to bridge the gap between what has already been learned prior to applying for an apprenticeship and what is required for degree accreditation, yet difficulties could arise at universities that are unfamiliar with an RPEL entry approach. This raises the issue of what counts, or doesn't count, towards accreditation. Recommendations in the Wolf Report (Wolf et al., 2016) and the Augar Report (Augar, 2019) highlight the need for addressing restrictive, academic assessment by offering more opportunities such as RPEL for assessing learning already gained from various contexts. For apprentices, there is no direct mandate on how prior learning is assessed; rather RPEL must be an option. Thus, there is the potential for tensions within educational settings on implementation of RPEL.

In addition, if learning is not acquired in their own, formal teaching setting, academics may question its validity, even if via direct credit transfer from another university (Valk, 2009; Cooper & Harris, 2013). The issue of validity is amplified when considering recognition of experiential learning from outside academia. Studies suggest that academics have the power to judge what is deemed recognisable (Peters, 2006), yet they may have fixed attitudes against experiential learning, thus acting as gatekeepers with a reluctance to credit those

who are seen as outsiders (Guo & Andersson, 2006). If such attitudes predominate, the accreditation process for RPEL becomes very narrowly defined, via a credential-based exercise of matching prior knowledge directly to academic Learning Outcomes (LOs). Such an approach raises the question of how to create opportunities to move towards a more inclusive developmental model, with emphasis on a reflective RPEL process.

2. Experiential learning and its relevance to apprenticeships

The foundations of RPEL are based on existing theories relating to the principles of experiential learning, so it is necessary to consider the question of how experiential knowledge, such as that gained at work, and academic knowledge compare. Academic knowledge develops, for example, by the acquisition of formal literacy practices, recognised through assessment of academic skills (Boud & Falchikov, 2006). However, this could be viewed as a very narrow definition of learning, as knowledge should not be treated simply as a product, or as merely completing a checklist against specific competencies (Wihak & Wong, 2011). Knowledge and learning can be effectively achieved via a range of experiences, through the process of personal development or via social practice and collaboration. Drawing on what has already been learnt can benefit both society and the individual (Andersson et al., 2013). Yet within academia, there are questions about the value of experiential learning, partly as there is no direct association with a formal taught curriculum. In consequence, there are discourses at play that tend to position formal academic learning as superior to experiential learning.

In relation to experiential learning, Kolb's reflective learning theory underpins a variety of learning contexts, specifically the type of learning that embodies experiential 'learning by doing' (Kolb, 1984), as outlined in Figure 1. Via active experimentation, both concrete experience and abstract analysis can be combined and, when experimental ideas are put into practice, another cycle for extending experience is generated.
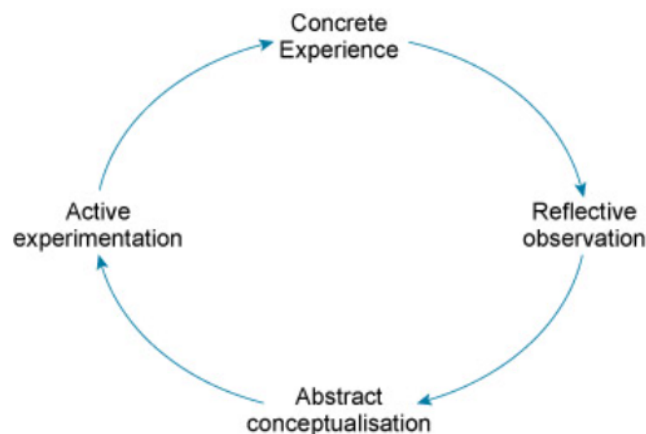

Figure 1: Experiential learning cycle (Kolb 1984)

While this definition of experiential learning is valid, for RPEL it can be viewed as just one facet of what it means to capture the complexities of adult learning (Harris, 2006). However, a cautionary note comes from Graf (2016), proposing that experiential knowledge and academic knowledge are not the same and are often for different purposes.

From the perspective of apprentices, there are the difficult dual targets of achieving recognised academic qualifications alongside development of relevant and transferrable working skills. In the UK, the take up of new-style higher level, degree and graduate level apprenticeships has been slow (Belgtay, 2018), which could be partly due to the difficulty in establishing a clear connection between apprenticeship experiential learning

and its recognition in the higher education system. Apprenticeships have a long tradition for robust skills development with the aspiration of an expert in their field passing on their skills to a novice via a lengthy training process of several years. As, historically, there was a clear focus on manual skills development (Keep & James, 2011), this model of skills development necessarily has an emphasis on experiential learning, with the dual aims of recognising competence in achievements alongside potential for development. Yet, throughout the twentieth century, uptake of traditional apprenticeships has fallen into decline (Chadderton & Wischmann, 2014) and, more recently, new government-led apprenticeships have been developed across many countries.

3. RPEL potential and problems for apprentices

In the UK, a changing model of apprenticeships has emerged which moves away from labour-intensive occupations towards office-based roles such as business management and IT support (IfATE, 2021). The driving force is to introduce opportunities for flexible role-based education and training, which combine development of skills-based competencies in conjunction with academic learning, thus blending experiential and academic. Therefore, rather than adopt the traditional master-apprentice relationship, modern apprenticeships follow a tri-partite model which includes an education provider in addition to the employer and apprentice. The implication is a shift in focus towards appreciation of experiential learning in an academic context, with inherent difficulties in how this might be achieved. As apprenticeships are well established in many countries, an exploration of global experiences can help highlight the potential of experiential learning in other contexts.

3.1 RPEL Potential

Pedagogically, RPEL acknowledges that learning can be achieved in a variety of formal and informal settings and provides an opportunity to articulate such learning. As the implication is that apprentices have an opportunity to build on skills and gain academic recognition for previous learning, RPEL is the ideal vehicle. This can be of particular advantage for mature learners, and for those with a working background. From an apprentice perspective, RPEL could be seen as empowering, as a way of accrediting previous experiences within a formal academic setting (Pokorny, 2012). There is the potential for increasing student confidence and self-esteem (Harris, 2006; Andersson, 2006; Klindt, 2021). RPEL can also be transformative, by digressing away from traditional education practices, thus helping to break down barriers between theoretical and experiential learning (Peters, 2006).

In addition, RPEL offers the academic community the opportunity to appreciate real-world experiences from a variety of occupational areas (Whisemore, 2015). There are two main ways that this might be accomplished; widening participation and advanced standing on programme. Firstly, considering RPEL in a widening participation context, it can create opportunities for access to HE for those without formal qualifications (Garnett & Caveye, 2015). Furthermore, Dyson & Keating (2005) argue that RPEL can be inclusive as an appealing route for women, and part-time learners. In addition, Van Kleef (2011) notes the potential for RPEL as an entry route to education for older learners, and Wheelahan (2006) suggests it as particularly appropriate for mid-career workers. This is of relevance to apprentices, many of whom have been in employment for a number of years. However, as the OU has an open entry policy, the second RPEL option, of advanced standing on qualification (Andersson, 2006), is of particular relevance to this study.

However, regardless of the potential of RPEL in these two areas, the application of RPEL can be ad-hoc, with many variations in practice (Andersson et al., 2013), and little evidence of widespread use of systematic processes in the adoption of RPEL in the UK (McCready, 2018). Yet there is the opportunity for RPEL processes to be thought of differently, in order to meet learning needs of the future (Klein-Collins & Travers, 2020). For

example, there is the potential to incorporate Short Learning Programmes (SLPs)into degree apprenticeship programmes as they can be adaptable to learner and employer requirements (Dunn, 2018). Recognition could be gained via short microcredentials, providing a flexible route within formal degree education (Cedefop, 2017; MOONLITE, 2020; Pittinsky, 2015). Although micro-credentials could provide development and recognition of employability developed outside the traditional learning system that may occur prior, after or during formal qualifications, it should be noted that for HE apprentices in the UK only prior experience can be counted towards an apprenticeship qualification due to finding rules. Thus, the potential of RPEL should be reviewed with caution due to restrictions on what is achievable in practice.

3.2 RPEL Possible Problems

There is very little research into RPEL processes for UK HE apprentices, yet the wider literature suggests that restrictions on RPEL in various contexts relate to enduring and ongoing accreditation issues across HE in general (Peters, 2006; Harris, 2006; Singh and Ehlers, 2019). However, the literature also suggests that it can be difficult to cross contexts, for example translating learning across from a work setting to an educational context, possibly compounded by academic restrictions. One such academic restriction is that it is only possible to award credit transfer for a complete module or modules, which limits the extent to which RPEL may be applied. More significantly, a further explanation for such restrictions is that RPEL applicants have limited academic experience and could, therefore, be unfamiliar with underlying conventions, such as a lack of exposure to academic discourse and writing experiences (Peters, 2006). In addition, the transition of counting experiential knowledge toward accreditation on an academic programme is a complex process (Cooper & Harris, 2013).

When making an RPEL claim, applicants must prepare the claim in accordance with academic guidelines, which in itself can appear daunting and time-consuming. The onus is on the RPEL applicant to take the initiative and are required to negotiate the process with little support, as 'an introspective and cognitive exercise' (Harris, 2000, p34). Further, if applicants are influenced by their own underlying assumptions about education and knowledge, they could be unaware of the significance of their prior experiential learning (Pokorny et al., 2017). Further, applicants may have insufficient time to prepare and submit their RPEL claim (McCreedy, 2018). Hence, questions arise regarding how RPEL is implemented and presented, and whether there is sufficient incentive and support for applicants to consider the complex transition to academia via an RPEL route.

4. Methodology underpinning the research design

Case study was selected for this research to best answer the research questions, although several methodologies were initially considered. As the research questions sought to uncover contemporary issues within the field of OU degree apprenticeships relating to 'how' and 'why' a social phenomenon works, case study research was relevant (Yin, 2018).

- **Research question 1 :** In the context of Higher Education (HE) what are the policy-level benefits and barriers when offering RPEL as a flexible entry route onto apprenticeship programmes?

- **Research question 2:** What are the opportunities and barriers for HE academic and academic-related staff when designing and implementing RPEL on apprenticeship programmes?

- **Research question 3:** What are the opportunities and challenges of RPEL from an apprentice perspective, on entry to HE programmes?

Figure 2 demonstrates how the different stakeholder views feed into the research. Central to the model is the RPEL experience of the apprentice.
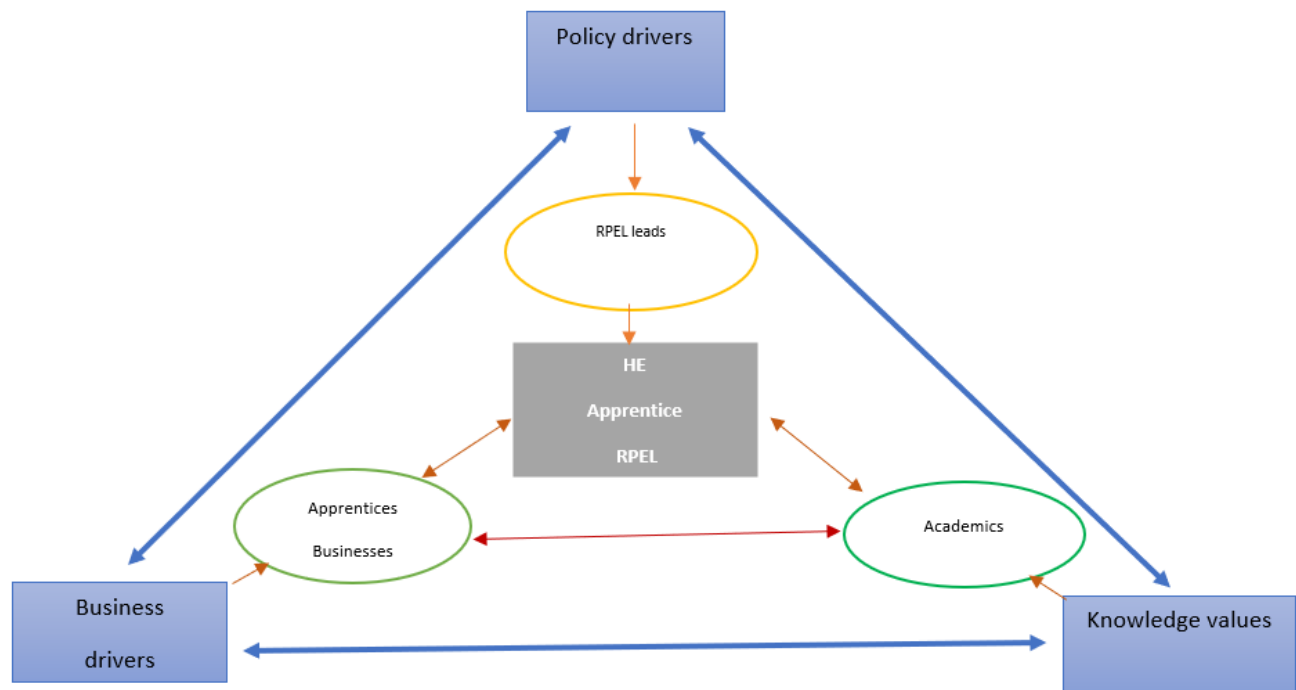

Figure 2: RPEL System change model and links to research questions - figure adapted from Millar and Xulu (1996), Cited in Harris (2000)

Considering the research from a macro level, political perspectives are most prominent. From a government viewpoint areas to consider include key policies, legislation, and reports relating to apprenticeships across the UK. From an educator perspective the provision of degree level apprenticeships introduces many challenges to the more traditional teaching and learning at this level in the UK. There is a partucular question regarding the perception of experiencial learning within a formal academic setting. From an employer viewpoint it is necessary to consider expert reports, specifically those that give an insight into the views of businesses regarding the take-up of apprenticeships.

5. Research Methods

Both qualitative and quantitative research methods were utilised, with emphasis on qualitative. Relating to qualitative methodology, Cooper and Harris (2013) give good direction on how to design a series of interviews that capture the voices of the many stakeholders relevant to research. The theme of researching across a variety of stakeholders was further extended by Pokorny (2012), where she interviewed learners and the tutors who performed the RPEL assessment. In the case study, theoretical knowledge underpinned the practical knowledge generation that was achieved predominantly via qualitative research methods, alongside some elements of quantitative, for example via data analytics and survey demographics. This combined approach adds to the validity of the research, as triangulation of data, is recommended for case studies (Yin, 2003).

As the purpose of the study was to understand the practices of RPEL via an in-depth case study, it was necessary to focus the data gathering around different stakeholder views. The initial participants within this study were identified through existing professional networks within the RPEL community so the sample choice was to some extent pragmatic, due to the limited range of stakeholders involved in RPEL. However, careful

selection of participants is essential in research such as mine as the data gathered plays a vital role in ensuring findings are reliable, even if not transferrable across contexts. To overcome some of the limitations of researching in a specialist area via case study, purposeful sampling was selected, alongside snowball sampling (Merriam, 1998). Purposeful sampling ensured appropriate samples within the case, and snowballing sampling involves asking subjects to refer me to others in the field. These methods both have the benefit of pinpointing subjects with a high level of expertise in the area of research.

6. Data collection and analysis

Understanding the context of RPEL was important, so the data collection tools were selected according to the requirements of the research in helping to answer the research questions. There were three stages to the research, one for each of the three research questions. For each stage, the main method of collecting qualitative data was via semi-structured interview, with appropriate ethical permission in place for staff and students (Wise et al., 2018). In addition, data were collected from internal reports, policy documents and surveys. Thematic anaysis (Braun & Clarke, 2006) was utilised when analysing the data, with concepts and themes amalgamated and consilidated via Nvivo (2022).

Stage 1 was an initial review of policy documents and grey material relating to RPEL. This was supplemented by analysis of internal academic RPEL guidance documents. The main qualative aspect of the research was via interviews with two RPEL leads, one from the case study university and an RPEL expert adviser from another university. Relating to the second research question, at Stage 2, OU academic staff were interviewed, specifically those with relevant RPEL backgrounds, in order to analyse the current RPEL narratives from a pedagogic viewpoint. Eight academic staff were interviewed, from three faculties; Science, Technology, Engineering and Maths (STEM), Wellbeing, Education and Language Studies(WELS), and the Faculty of Business and Law (FBL). For the third research question, the focus was on the practice of implemeting RPEL. In particular the experiences of apprentices and those introducing RPEL to apprentices were sought. Over 200 apprentices were surveyed, seven apprentices were interviewed, and six business-related staff were interviewed.

7.Results and discussion on recommendations

For this case study, a range of sources was explored in detail, to tell the 'story of the case' (Simons, 2009). These included external and internal documents, university websites, surveys, and interviews.

7.1 Benefits: learner benefits, employer benefits, institution benefits

Motivational considerations was a common theme for learners. The document review of perceptions of RPEL across various government and regulatory bodies clearly exposed an overwhelming positivity around the potential for RPEL from a policy level, especially from learner and employer perspectives. RPEL now more established, with increased opportunities to apply for RPEL at higher level studies. Of particular relevance is the potential for RPEL opportunities for a range of HE apprenticeships in many kinds of professions, as shown in the student sample detail in Figure 3. It can be seen from the figure that a number of the apprentices are employed at managerial level, suggesting that they have a good level of experience when entering their apprenticeship. What is less clear is whether there was the opportunity to capture this experience via the RPEL process.
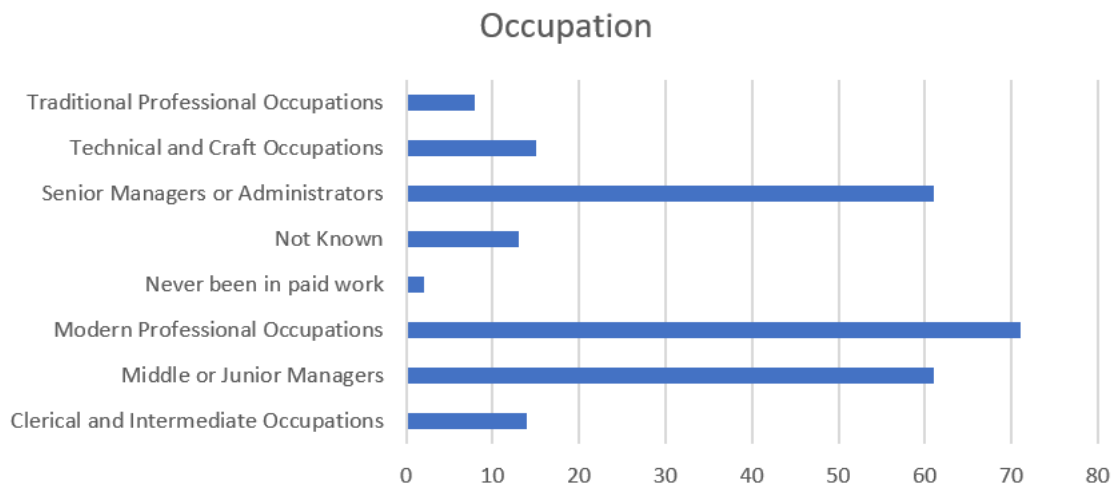
Occupation

Figure 3 – Apprentice Occupations

 The RPEL experts both promoted the opportunities for RPEL, suggesting that RPEL could be empowering, and a means of accrediting previous experiences within a formal academic setting. The RPEL lead at the case study institution suggested that RPEL could help increase access to HE, noting *'opportunities for us [OU] to attract learners that would not normally consider studying'.* This highlights the potential value of experiential learning, that could otherwise be overlooked. The RPEL lead also emphasised the desire to value all learning, in particular by acknowledging that prior, informal learning already exists, suggesting that educators are *' valuing that learning is of the same quality level as what you would study on the module'.* The second RPEL expert noted that *'you want people to feel that they're continually building on their personal development and their lifelong learning',* and *'add value to society'.* The suggestion is that RPEL can be inclusive and help to increase student confidence and self-esteem. Clearly there is a desire to appreciate all learning, not just that studied in formal academic situations, yet how this might be accomplished is far from straighforward.

In addition, the reduced time taken by the learner to complete a programme was noted, with one of the RPEL experts suggesting that there is '*opportunity for them to spend less time and cost on completing a qualification'*. There is a linked potential benefit to employers, in that reduction in duration of study can lead to cost savings. This was emphasised by one of the business related professional interviewees, who noted that '*we're looking at options as to how we can potentially maybe offer a fee reduction to the employer so that we're not duplicating learning'.*

Furter, from the employer viewpoint there were positives within the document review and interviewee responses, indicating that RPEL implementation could help combat skills gaps, as noted in the literature review by Singh and Ehlers (2019). From the wider document review, RPEL has emerged in several countries as a levelling-up process, thus reinforcing the positives aspects from both an employer and learner perspective. The difficulty is establishing how to align the experiential learning gained from the workplace role with the academic requirements of the apprenticeship. This must be accomplished prior to enrolment onto an apprenticeship, and requires an accurate assessment of prior learning. As an example, one member of the apprentice recruitment staff noted that *'once we have... the skills audit that they will complete with their line manager, it gives us a real indication of prior experience and how that fits into their current role.*

From an educational institution perspective, the increase in RPEL opportunities within the education sector suggests that there are new opportunities, in particular for the HE sector. The introduction of mandatory RPEL

within UK apprenticeships, also mentioned in the document review and interviews, has helped to increase RPEL opportunities, with the case study RPEL lead noting that *'outside of apprenticeship space, I think there are opportunities for us to attract learners that would not normally consider studying.* This in turn could enable higher level learning to take place in contexts other than traditional universities, and being accredited via RPEL. There is the opportunity to build the experiential learning into learning programmes, as suggested by one of the academic leads; *'So we will, we will build it in right from the start, rather than what we ended up doing on [this module], which was retrofitting it.'* The promise of such opportunities is exciting, yet much work is needed to put into practice.

7.2 Barriers
There were defined barriers revealed via the research quetions, in particular relating to uncertainty and contradictions regarding RPEL, time and workload issues, scalability, and academic reputation.

Considering potential RPEL barriers, potential applicants' uncertainty around the concept of RPEL was raised as an issue. A concern was that apprentices might say '*I don't want to be RPELed for that module, because, you know, I don't know what I don't know*'. The evidence suggested that potential applicants could be unaware of the significance of their prior experiential learning (Pokorny, Fox & Griffiths, 2017). Further, from the review of RPEL documents and website detail, it was clear that understanding what RPEL is, and how to apply, is far from straightforward.

Also from a learner viewpoint, questions were raised on how open RPEL is in practice, and how widely it is publicised. There is no easy way to advise potential applicants on the regulations regarding the currency of learning or how they may be supported if applying for RPEL, especially as the document and website reviews revealed wide variations of practice. For example, for those who completed the apprentice survey it was evident that most of those who responded indicated at least a partial match of their work experience to their apprenticeship study area, as shown in Figure 4.

Before commencing your Apprenticeship how closely did you feel it would match your prior work experience?

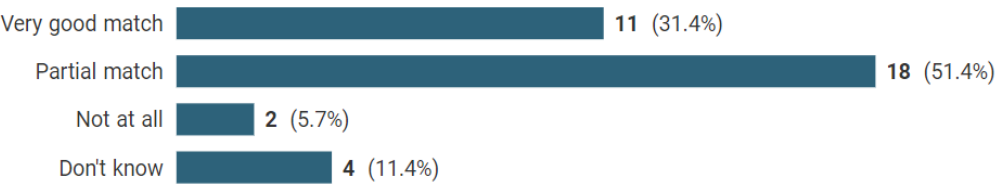|	
Very good match	11 (31.4%)
Partial match	18 (51.4%)
Not at all	2 (5.7%)
Don't know	4 (11.4%)

Figure 4 – comparison of work experience to apprenticeship study area

However, take-up of RPEL has been very low. Survey findings showed that reasons for not applying included issues relating to currently of study, for example experience being out of date, and uncertainty of the RPEL process prior to starting study. The uncertaintly is not surprising as, with reference to Figure 5, it can be seen that there is variation between a cross-section of UK universities regarding how RPEL can be implemented, and whether it is RPEL for entry to qualification, for credit on qualification, or both.
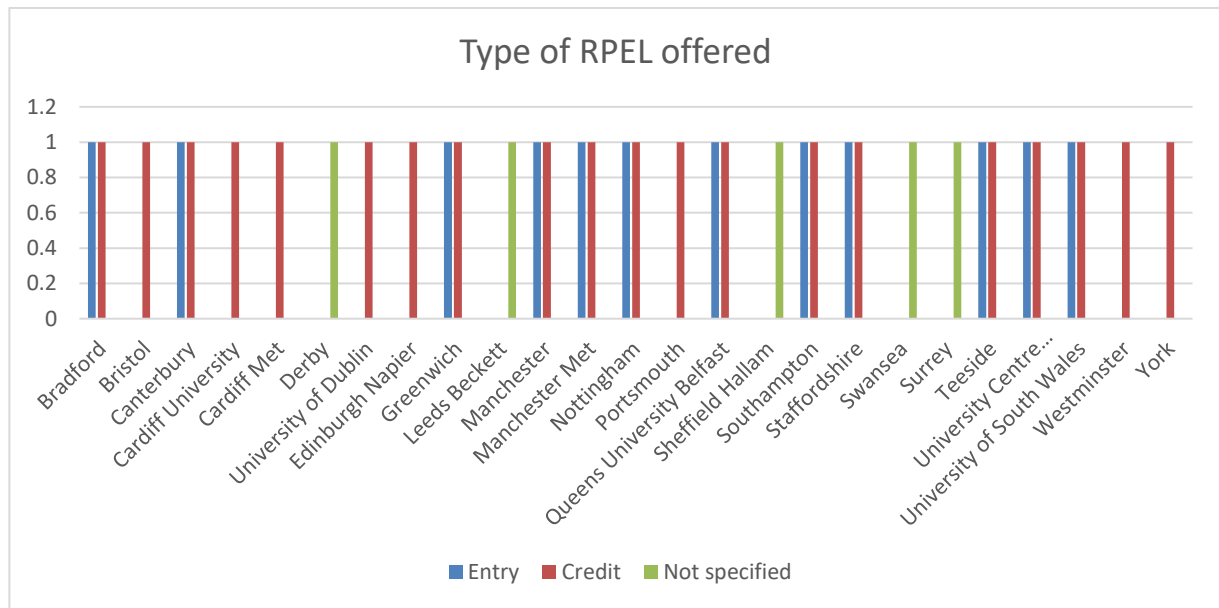
Figure 5 – Review of RPEL for entry to qualification, and credit on qualification

Time and workload issues were also both major factors mentioned in the interviews as inhibiting factors. The RPEL leads both expressed concern that although RPEL could, in principal, align with the mantra of "less time, more options" (Dyson &Keating, 2005), the restrictions on apprenticeship programmes made this difficult to implement. RPEL barriers also related time for learners to engage in the RPEL process, with a suggestion that the reason why RPEL wase not taken forward was due to extremely tight deadlines, with the internal lead noting '*there's quite a quick turnaround require*d'. This is at least partly due to the complexities of the RPEL process itself, with many stakeholders involved. Also mentioned was the amount of evidence that must be produced, leading to the suggestion that apprentices might think '*why don't I just do the module*?'

Further RPEL process complexities and uncertainties were raised from an educational institution perspective. For example, the internal RPEL lead reported that RPEL policies were reviewed from *'institutions across the sector, across the different nations, to just identify how they … award recognition for prior experiential learning'.* Following this review, RPEL pilots were implemented, with objectives being to define and test a method for assessing RPEL which meets both the institution's needs and funding agencies' requirements, which are not always compatible. Uncertainty was also raised around funding issues that the institutions offering RPEL needed to address with one of the RPEL experts suggested that funding rules were '*not as black and white as the government thinks, particularly when they're looking at auditing funding for apprenticeships'*.

The interview discussions also revealed complexities relating to the high volume of stakeholders and stages of the RPEL process, resonating with the findings of Cooper and Harris (2013) where they suggest that counting experiential knowledge toward accreditation on an academic programme is a complex process. Both RPEL experts suggested that applicants may not have insufficient time to prepare and submit their RPEL claim. The consequence is that the costs and workload of RPEL implementation could hinder the introduction of RPEL on degree level study.

On a related note, the complexity of implementing RPEL brings scalability into question. If feasible to encourage a large number of RPEL applicants, the financial implications must be considered if fees are

reduced. A related concern was the size of modules, and the internal RPEL lead raised a specific point, saying '*I think we are quite unique in the sense that we have 60 credit modules and 30 credit modules'.*

There is the need for agreement on an appropriate and scalable method to assess RPEL claims across all nations, as well as identify the method for processing an RPEL claim. One of the academic staff expressed concern, stating that '*if it [RPEL] did bring in large numbers, how would we cope? And could we adapt existing systems to give us something that would work that way?'* Clearly some mechanism of scaling up RPEL processes would be needed, and the academic went on to suggest ' *there is a whole sort of, you know, cottage industry that would need to be set up behind it, and it would need to be sustainable'.*

The implication is that the task for potential RPEL candidates is onerous to complete within a limited time scale, and also involves much work for academics when making the assessment. In fact , one of the RPEL leads suggested that we are '*doing it [RPEL] for apprenticeships, because we have to.*'

A further major barrier was revealed as concern regarding reputational credibility relating to assessment and verification from educational institutions. Issues raised included the impact of RPEL on the endpoint assessment for apprenticeships with one RPEL lead suggested that '*As an academic organisation, we have to be confident that what they're saying is true.'*

8.Conclusions and future research

Although recommendations in the Wolf Report (Wolf et al., 2016) and the Augar Report (Augar, 2019) highlight the need to address conventions relating to restrictive, academic assessment, this can be extremely difficult to achieve. As revealed in the findings, there is a real tension in the myriad ways of applying RPEL. The RPEL leads reported many challenges associated with the different RPEL activities that take place when assessing prior learning, as outlined by Atlay and Turnbull (2017). RPEL processes are not as recognised or defined as RPCL, as credit transfer has been established for many years (Pollard et al., 2017). The complexity of the RPEL process could lead to uncertainty within the academic institution, the implication being a possible lack of promotion of RPEL as suggested via the conference summary.

Concerns were raised, even though RPEL offers the opportunity to appreciate real-world experiences from a variety of occupational areas (Whisemore, 2015). Interviewees reported that it can be extremely difficult for assessment to cross contexts, an issue raised by Guo and Andersson (2006). The implication here is that validation of RPEL could be problematic and, in particular, the question arises on how academics view experiential learning when compared to academic study. The pedagogy of RPEL is less fully defined (Pokorny, Fox and Griffiths, 2017) and hence the value of experiential learning might be questioned.

However, there are new opportunities to consider, for example by introducing an element of online testing into the RPEL process, or by assessing RPEL via microcredentials. Clearly RPEL has potential for increasing access to HE, and valuing that experiential learning is valid across a range of contexts. Further research is currently investigating the feasibility of such innovations in the implementation process relating to RPEL.

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Changing the Educational Landscape: Towards Resilient European Universities

Building Digital Capabilities in the Atlantic Technological University (ATU) in Ireland: learnings from the digital transformation journey

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Abstract

In 2019, the Atlantic Technological University (ATU) Ireland (previously known as GMIT, IT Sligo and LYIT) were awarded a HEA Innovation and Transformation award to build digital capabilities across 8 campuses. The project is called iNOTE and it provides opportunities to transform the higher education experience in the CUA institutes (2019-2022). The Teaching and Learning Centre (Galway-Mayo) is leading the development of DigitalEd.ie Knowledge Platform and digital teaching and learning development initiatives (i.e., Work Package 2 of the iNOTE project).

DigitalEd.ie, is a digital teaching and learning knowledge platform, which provides access to professional development pathways and a suite of digital resources, to build digital capabilities and pedagogic expertise, so that educators can design, deliver and support flexible and online learning programmes effectively.

This paper will discuss: the development journey of DigitalEd.ie; building a digital education community; designing digital learning pathways; creating a digital resources directory; insights and impact of building digital teaching and learning capabilities during the pandemic; and the creation of a suite of digital education services and resources, that is transforming the higher education learning experience.

The development journey of DigitalEd.ie knowledge platform uncovered several resources and learnings, including a discovery tool, digital tools to support online student engagement, meaningful and robust assessment strategies, digital badges and learning pathways, and teaching and learning techniques moving from online to hybrid delivery. In addition, 20 digital teaching and learning impact case studies were developed across eight themes (https://DigitalEd.ie/book), outlining how and why educators transformed their teaching and learning practice and the impact on student engagement.

This paper will conclude with feedback from participants who undertook digital learning opportunities through the DigitalEd.ie monthly training programme, the Discovery Tool, Digital Badge pathways, and an accredited postgraduate Certificate in Digital Teaching and Learning. The feedback gathered through the action research study provides insights on the value of Continuous Professional

Development (CPD) and considerations for the digital learning environment in higher education, post Covid-19.

Keywords: Digital Education, Digital Teaching & Learning, Online Teaching, COVID online learning, Student Engagement, Student Success, Digital Transformation.

1. Introduction

ATU includes eight campuses in the West and North West of Ireland with 22,000+ students including 40+ nationalities. The Strategic Plan 2019-2023 developed by GMIT (ATU Galway-Mayo) prior to becoming the ATU outlines thirteen goals that place the student at the centre of everything we do. Digitalisation and the use of technology are a key strategic priority for the ATU. In 2019, GMIT along with higher education partners IT Sligo and LYIT in Ireland were awarded a HEA Innovation and Transformation award to build digital capabilities in the Connacht-Ulster Alliance (CUA). The project is called iNOTE and it has provided opportunities to transform the higher education experience in the ATU campuses.

In March 2020, the physical closure of all campuses across the ATU, forced everyone online in a hurry and transitioned our learning, teaching and assessment activities to a new platform. The COVID 19 emergency fundamentally changed the way we all live and work, and this had an enormous impact on the teaching and learning experience across the ATU. The transition has been challenging, but it has also presented a number of opportunities for developing digital capabilities among the teaching community and alternative strategies for student engagement.

Transitioning to online teaching and learning was made possible due to a number of factors including: the advances in education technology globally in recent years, and the seamless integration of Microsoft Office 365 suite and Moodle; the Connacht Ulster Alliance (CUA)/ATU engagement with a HEA funded digital education development project called iNOTE, and the development of https://DigitalEd.ie; the Teaching and Learning Centre's digital teaching and learning online support resources and rapid response digital education workshops; a suite of flexible online learning development courses; the flexibility and dedication of the teaching community engaging with digital professional development; and the creation of the blended and online learning transformation (BOLT) steering group for GMIT during the emergency in 2020.

A range of initiatives established, that are building digital teaching and learning capabilities across the ATU include: *the development of a digital champion team representing each academic department; Ask Me Anything (AMA) clinics; digital teaching and learning small group workshops; a digital education webinar series; alternative assessment strategies workshops; show and tell insight sessions on digital technologies; recruitment of graduate student mentors; online PASS leadership sessions to support the first year experience; the digital education development pathway at DigitalEd.ie for*

academic staff; digital professional practice alternatives; and investment in a remote teaching technology toolkit, for all staff working remotely.

To begin, this paper will explore a literature review on teaching and learning challenges during the pandemic, followed by the development story of DigitalEd.ie knowledge platform, feedback from stakeholder engagement and focus groups with the Digital Champion community, the impact of the DigitalEd.ie initiatives to date, and finally the paper will conclude with a discussion on lessons learnt.

2. Literature Review

Reflecting on the response by higher education institutes to the challenges involved in the sudden relocation of teaching, learning and assessment away from the traditional campus environment, is presented in a variety of reports, and this has guided the transition and digital transformation journey in ATU over the last 12 months. Key national reports include: the QQI (2020); the National Forum for the Enhancement of Teaching and Learning (2020); the USI (2020); ATU annual reports to the HEA on the iNOTE project (2020 and 2021); a special GMIT Student Opinion Campaign undertaken in partnership with the GMIT Student Union (2020 and 2021); and an open discussion forum with academic and professional services staff in GMIT, to identify the challenges encountered with remote teaching.

Overall, the reports collectively refer to the enormity of what was achieved through dedication, collaboration and innovation in moving teaching, learning and assessment online. In September 2020, an analysis of the COVID higher education reports, reflecting on the learning, teaching and assessment experience, was prepared by GMIT Teaching and Learning Office and the findings were categorised under eleven themes including: *working and studying at home; teaching and learning; assessment; policies and procedures; college experience; digital skills and academic professional development; communications; health and wellbeing; fees and finance; resources, supports and access; return to campus.* The findings were considered by Academic Council and the Governing Body and have helped pave the way for the next phase of ATU's digital transformation journey, including managing the COVID-19 remote learning experience.

Within a very short period (i.e., one-two years) many researchers in higher education institutes both nationally and internationally, have also shared their teaching practice experiences during the pandemic. The main objective of higher education practitioners was to allow their students to achieve the learning outcomes and continue their education during the COVID-19 global pandemic. The pandemic was an opportunity to pave the introduction of digital teaching/technology enhanced learning (TEL) and to introduce new assessment strategies and alternative assessment opportunities. The DigitalEd.ie project was a particularly valuable resource for higher education lecturers across the ATU, in supporting this.

A relevant and recent study, that reinforces the importance and impact of digital education resources and training, was published by UCD (2021) titled, 'Online Learning Experiences of Irish University Students during the COVID-19 Pandemic'. Responding to pandemic and remote teaching challenges that arose in March 2020, this study investigated 132 full-time Business postgraduate students' online learning experience in an Irish University. Findings from both quantitative and qualitative data

provide insights into what worked, what did not and why. This study found that most students still prefer in-class learning, despite some very positive online learning experiences (Yang, 2021). They felt that the social aspect and the learning benefits from face-to-face interaction with instructors and peers are not fully replicable in the online learning environment. The findings suggest that the foundation for an effective online learning experience is engagement. Synchronous delivery happens in real time, this means students and teachers can interact in a live, virtual place and engage in real-time online communication and discussions regardless of location (Snart, 2010; Clark and Mayer, 2016). Students spoke highly of the classes, that have interactive activities, which allow them to engage with their instructors and classmates. These activities were commonly associated with live virtual sessions. Where such activities occurred on a regular basis, students felt more connected to their peers and teachers (Yang, 2021).

The findings from the UCD report, correlate well with the GMIT/ATU Galway-Mayo OpinionX student experience study conducted in June 2020 and February 2021. The OpinionX engagement campaign was organised to understand the experiences of the Galway-Mayo students during remote learning and assessment. The survey engaged 1,253 students accounting for nearly 18% of the total student body. The OpinionX approach, is an 'open-survey/discussion platform' which means that participants not only submit written responses to a question, but they also vote on each other's submissions. This data was used to surface the opinions that best represent the views of the wider population. The study in 2020 and 2021 explored the Galway-Mayo student learning experience during the COVID remote learning period and found that lecturers overall have done a good job during the pandemic using interactive and engaging online learning methods such as quizzes, the digital whiteboard and online polls. Students also shared their views on continuous assessments and online exams, noting their preference for online exams rather than the in-person exam hall experience. Overall, 52% agreed with a statement that they have adapted well to online learning and a further 62% agreed with a statement that they were struggling with online learning. This represents the student experience in higher education nationally (USI, 2020), where students shared their struggles with adapting to online learning, while also recognising some of the benefits gained from digital education experiences.

Furthermore, the UCD study reported on the technology students most enjoy including a digital interactive whiteboard, Microsoft Teams and OneNote (Yang, 2021). The literature reports on three main factors influencing teachers' use of technology including: the experience of other teachers; availability of technology in the classroom; and availability of in-school training (Yang, 2021). There are also challenges to consider, where some teachers lack confidence in using this technology and this can influence their use. The National Literacy Trust (Picton, 2019), found most teachers supported using technology but cited lack of training as the major barrier. Almost a quarter (23.3%) had no training in using technology in literacy teaching. Research shows that teachers must know how and when to use technology which, when used appropriately, is an important tool in the classroom (Hollebrands, 2020). Teachers' levels of technological skills and capacity to adapt both the quality and quantity of curriculum, are essential for student success.

An interesting study carried out by Kimmons, et al., (2020) 'Trends in Educational Technology' presented a detailed analysis of the future trends in educational technology, stating that most changes in 2020 seemed to be changes of degree rather than kind and that in many ways the educational technology field was already trending in directions, that seemed to be necessary for addressing the pandemic before it started. Furthermore, this study commented on the fact, that many education leaders were already using tools and digital technology prior to 2020 for improving productivity and sharing valuable resources and expertise, and the report considers that it does seem clear that our collective abilities to respond to and cope with the pandemic would likely have been even far more strained if these tools, practices, and research topics had not been so firmly in place, to begin with (Kimmons, Rosenberg & Allman, 2021).

Furthermore, a relevant study with Crick et al (2020) titled 'The Impact of COVID-19 and Emergency Remote Teaching', outlines the impact of these changes to the practitioner's teaching in the discipline of computer science in the UK. This research is based on quantitative and qualitative results from a large-scale survey of the educational workforce (i.e. approx 2,197 respondents). This study was conducted in the months after institutional closures in March 2020 and the shift to online delivery. This research reports on how educators teaching computer science in various UK-settings (n=214) show significantly more positive attitudes towards the move to online learning, teaching and assessment, than those working in other disciplines. These perceptions were consistent across other schools, colleges and higher education institutions. Practitioners noted the opportunites of these changes for their respective sector, especially a renewed focus on the importance of digital skills (Crick, Knight, Watermeyer, & Goodall, 2020).

The DigitalEd.ie platform began its development journey prior to the pandemic responding to the need to develop digital capabilities in the higher education sector. Its design was informed by the EU Digital Competence Framework and the JISC (2018) Digital Capabilities Model. Both frameworks provided a structure to build DigitalEd engagement initiatives including a four step process to build digital capbailities and experise in online and flexible learning (see Figure 1). Examples include the Digital Discovery Tool, Digital Resources Directory, Learning Pathways, Digital Badges and a quality course design scorecard named OSCQR and originally designed by SUNY (New York State University). In addition, the platform provides a gateway to research papers reflecting the importance of pedagogy first and technology second.

Feedback from participants who have engaged in the digital resources and technology enhanced learning DigitalEd.ie pathways during the pandemic, recognised the value of the training, the platform and the digital tools implemented, to support higher education staff and this has been documented in a range of cases studies in the DigitalEd book (Ginty, et al., 2021). The case study experiences documented in the DigitalEd book correlates well with Kimmons et al (2021) experiences and a study conducted by Nunez-Canal, et al., (2022) based on the 'European Framework for the Digital Competence of Educators (DigCompEdu)'. This EU study identified 22 competences in six areas of competence. This paper analysed 251 responses from a sample of higher educators from Madrid's universities. The results show the relevance of educators' characteristics to the learning process concerning previous knowledge about technology, training received, and their attitude toward technology. An important finding from this paper is that digital competence has evolved from being a mere tool to becoming an essential pedagogical element (Núñez-Canal, de Obesso and Pérez-

Rivero, 2022) . This study reflects the importance of pedagogy and the aligning with digital tools and digital teaching practices.

3. Research Methodology

The research methodology chosen was informed by the research questions. The paradigm adopted for this study is mixed methods and the research strategy is a case study via an action based research project, exploring digital teaching an learning in the higher education sector of ATU. Action Research is research carried out by practitioners and is primally about developing practice and empowering practitioners (Lewin, 1946). This action reserach study explores digital teaching and learning development initiatives in three higher education institution sites working towards a new technological unversity in Ireland.

Action research ideology emerged from the social psychologist Kurt Lewin. In his paper 'action research and minority problems' (Lewin, 1946), where he describes action research as research leading to social action. Lewin (1946) outlines action research, as a series of steps. These steps have been applied and undertaken in this research study:

1. Defining the problem
2. Examine the Idea/problem and gather information about it
3. Plan Action
4. Take Action
5. Reflect on the consequences (Yue, Hillon & Haddad, 2018).

As outlined in Lewin's model above, action research involves always building on your findings, planning and reflecting on these findings to inform the next planning phase, a continuous improvement research method. Mcliff (2016) suggests that action research is a form of dialogue than a technique, where practitioners reflect on their process and make choices based on their findings and actions taken.

The research strategy conducted was a multi-site case study of the impact of technology enhanced learning on teaching practice in higher education and the impact of digital teaching initiatives on the students learning using an action research study approach as outlined below. Practitioner/action research can be described as any research into practice undertaken by those involved in that practice, with an aim to change and improve it (Mertler, 2009).

Both quantitative and qualitative methods are used in the study in order to elicit data which will quantify the impact of digital teaching and learning on teaching practice in higher education. Qualitative research methods are also used to derive the perceived benefits of course delivery using digital technology, the perceived benefits to student learning and the perceived impact formal TEL and digital training resources.

Using quantitative methods alone would limit the type of data to be elicited. Therefore, it is essential to incorporate methods that would allow for qualitative analysis. The characteristics of quantitative research which have developed since it was first employed in educational research in the late 19th century include:

"an emphasis on collecting and analysing information in the form of numbers... an emphasis on collecting scores that measure distinct attributes of individuals and organizations and an emphasis on the procedures of comparing groups or relating factors about individuals or groups in experiments..."

(Creswell, 2005, p.41)

The data collection methods include a survey and focus groups with academics and professional services staff. A survey is aimed at ATU staff who have engaged with DigitalEd.ie (n=500+). A student remote learning experience survey was targeted at students in ATU Galway-Mayo campuses (n=1000+). The purpose of the staff questionnaire is to extract the opinions of the higher education lecturers and elicit information with regards to the effectiveness of the impact of the Digital Teaching and Learning (DTL) resources and learning pathways at https://DigitalEd.ie and an accredited certificate in DTL.

The staff questionnaire was deployed electronically. Questions were designed to capture the views of the participants in relation to the DigitalEd knowledge platform, their teaching experiences during the pandemic. assessment strategies, feedback and supports needed.

In addition, structured focus groups were held with staff across the ATU that have engaged with the DigitalEd knowledge platform. Focus groups are an established mechanism for data collection across qualitative, mixed method, and quantitative methodologies (Pearson & Vossler, 2016). Although employed differently within each research paradigm, the popularity of focus groups is increasing (Carlsen & Glenton, 2011; George, 2013; Kress & Shoffner, 2007; Massey, 2010).

Participants in the study have been asked to reflect on their teaching practices. However, the researchers are conscious that the context of the pandemic may cause feelings of stress, distress, anxiety or worry for some and this may be reflected in the study data. A further ethical consideration relates to the anonymity of the participants and confidentiality of the information obtained.

4. DigitalEd.ie Knowledge Platform Development Story and Research Findings

In June 2019, the Teaching and Learning Centre (TLC) team in ATU Galway-Mayo commenced a digital capabilities audit across eight campus sites, and this was followed by an audit of digital education tools available through various online platforms. In parallel to this activity, GMIT established a partnership with the State University of New York (SUNY) (a network of 60+ campuses in New York state delivering online programmes), to learn about their online teaching and learning strategies and approaches in building a student support services model for remote and blended learners. Following the review of SUNY teaching and learning resources for the online teaching community, ATU TLC (Galway-Mayo) began to work on the development of a Digital Education knowledge platform, a Digital Champions programme, an online self-directed course on 'how to teach online' and the creation of a level 9, Certificate in Digital Teaching and Learning, aimed at higher education staff.

By October 2019, the national INDEX digital staff and student experience survey launched in Ireland, and this examined the digital experience of staff and students in ATU and higher education institutes throughout Ireland. This audit and evaluation of digital capabilities in ATU campuses, provided a

strong foundation for the design of the DigitalEd.ie knowledge platform (see Figure 1). The TLO planned to launch the Digital Education platform in quarter 2, 2020. However, when COVID-19 broke out in Ireland in March 2020, this quickly accelerated the TLC plans, and the launch was brought forward by several weeks to support the crisis unfolding. In addition, a suite of specialist online clinics and LTA support services emerged to guide teaching teams and students' engagement with remote learning.

Figure 1: DigitalEd.ie Knowledge Platform

The ATU Teaching and Learning Centre (Galway), led out on the design and coordination of a range of rapid response initiatives to support staff and students. This aligned well with the outputs emerging from the DigitalEd.ie Knowledge platform resources and services suite (see Figure 2, Graphic illustration on DigitalEd.ie development). In parallel to this, online sessions were opened up to Sligo and Donegal ATU campuses as part of the DigitalEd.ie and iNOTE project.
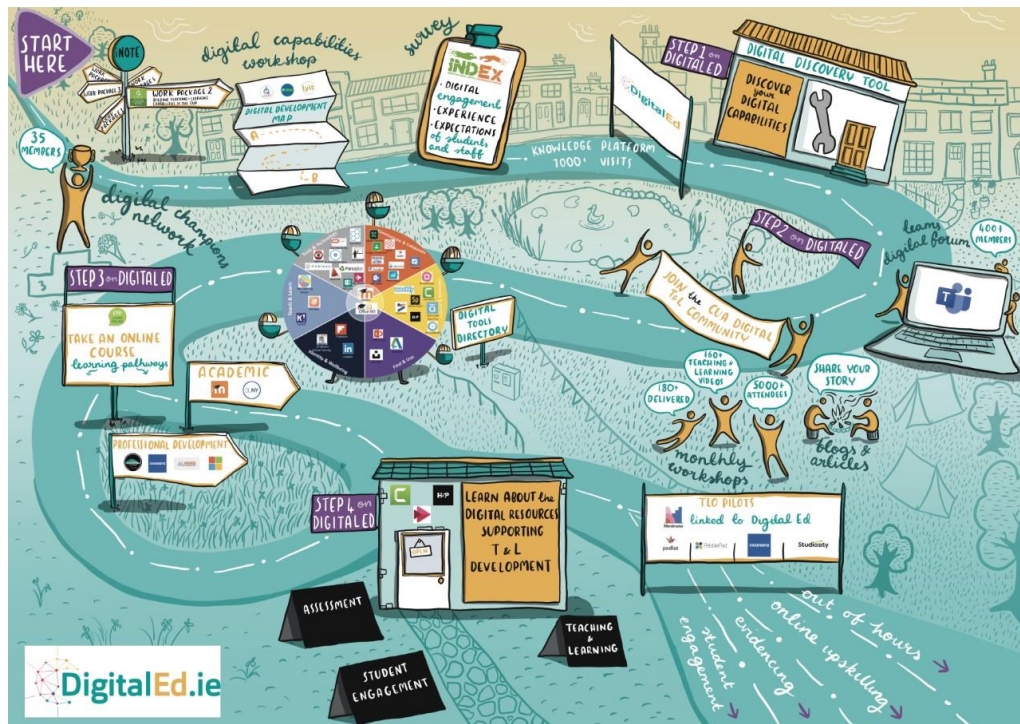
Figure 2: Graphic Story on DigitalEd.ie Developement

During the crisis of March-May 2020, collaborative discipline teams emerged, and a team of Digital Champions supported each other through various online panel sessions, sharing best practice in digital teaching and remote learning. To further support the digital transformation challenges emerging, the GMIT Executive Board {EB) established the Blended and Online Learning Transformation (BOLT) initiative, to provide further COVID-19 rapid response supports, that would impact every functional area in the institute. The BOLT steering group was established in April 2020 to develop a plan for remote learning in the 20-21 academic year commencing in September 2020. The steering group included: A chair, member of the EB; members of various academic departments; academic affairs administration; Teaching and Learning Office; IT Services; and the Student's Union. The rapid response initiatives implemented since March 2020, through BOLT and DigitalEd.ie, that have played an important role in transitioning to teaching, learning and assessment online, are outlined in Table 1 from items 1 to 17.

Table 1: Rapid Response Initiatives implemented in GMIT in response to COVID-19 DigitalEd.ie and BOLT.

Response Initiative	Description	Who benefited?
1. Digital Teaching & Learning Knowledge Platform	A Digital Teaching and Learning education platform (see Figure 2), providing access to digital learning pathways, a discovery tool, digital stories, a digital resources directory, a digital champions network and a digital education forum. The platform can be accessed at https://DigitalEd.ie	Lecturers in GMIT, IT Sligo and LYIT *It is also accessible to the higher education sector under a Creative Commons Attribution-Non-Commercial-Share Alike 4.0 International Licence.*

		25,000+ visitors recorded to date (as at Sept. 2022)
2. AMA Clinics – Ask Me Anything Clinics	Online One-to-One Clinics with the TLO team of Learning Technologists to troubleshoot online teaching challenges with Moodle, Teams and more and to assist in redesigning of a module or assessment for online delivery.	All Lecturers in GMIT/ATU Galway-Mayo *750+ AMA clinics to date (as at Sept. 2022)*
3. Graduate Student Mentors	Student mentors to assist the students with online engagement and to follow up where there is lack of engagement.	All Students in each academic Dept. in GMIT **20+ Graduate Mentors in place supported by BOLT 2020-2021.**
4. Digital Academic Champions	A programme developed to allow digital champions, who have undertaken formal training in digital teaching and learning to mentor their colleagues in online delivery in each academic department.	20 Lecturers in GMIT + 6 Champions established in IT Sligo and LYIT collaborating and sharing practice (2020-2022) **50+ Digital Champions completed Digital Badge Pathway to date, 2022.**
5. PASS Student Leadership Programme	**Peer Assisted Study Sessions (PASS)** are designed to help first year students cope better with all aspects of life at third level and focus on student integration, engagement, support, empowerment, and leadership to help students quickly adjust to third level life. As a response to COVID, PASS moved to online delivery to include an online PASS Leader Training Programme which included more than 60 student leaders trained to deliver weekly online PASS sessions. A PASS Academic Champion team, mentor PASS Leaders across the institute and first year students promoting engagement with first year PASS study sessions in an online learning environment.	First Year Students **60 student leaders annually leading weekly timetabled online PASS sessions on MS Teams across ATU Galway-Mayo/GMIT**
6. Student Hub – Online Portal	From Sept. 2020, GMIT established a central student portal 'one stop online shop' where students can gain access to a variety of student supports and information on studying, online assessments, IT services, campus information, health and wellbeing, student life, finances, student rights and responsibilities, and planning for the future.	All Students in GMIT/ATU Galway-Mayo **Supported by the BOLT initiative serving all students.**
7. GMIT Healthy Campus	A committee of staff and students established since 2019, to promote health and wellbeing throughout the Institute's mission, strategy, policies, plans and practices wherever possible. As a response to COVID, Healthy Campus launched a series of online services and activities that students and staff can avail of to include virtual staff and student choirs, online fitness classes, mental health training programme for staff, online Smart Consent training programme for students, and various online campaigns and promotions addressing healthy eating, physical health, mental health & wellbeing, and sexual health & identity.	All Students & Staff in GMIT/ATU Galway-Mayo

8. Student Success – Online Learning Support Guides	In response to COVID-19 a range of resources were developed by TLO to support students learning online, and include: A short animation explaining the **steps to success in online learning and student engagement in GMIT.** A short guide for students is also available at this link covering steps to success and some practical advice for GMIT students learning online during COVID-19 (published in March 2020).	All Students in GMIT/ATU Galway-Mayo
9. GMIT's Digital Learning Charter	**GMIT's Digital Learning Charter** outlines our mutual responsibilities and provides a framework for managing our communication and behaviour in a digital world. It should be taken as a statement of our shared values rather than as a rule book. It illustrates the way in which members of GMIT staff and students should work collaboratively so that everyone can benefit. GMIT will aim to support all our learning community to engage in a safe and responsible manner when engaging in digital learning. GMIT Digital Charter is available at this link GMIT Digital Communication Principles animation video is available here. **GMIT Digital Communication Principles** 	All GMIT staff and Students/ ATU Galway-Mayo **Supported by the BOLT Initiative.**
10. Academic Integrity, GMIT Student Guide	 Student Guide to Academic Integrity in GMIT is available at this public link and here on the Student Hub	All GMIT Students and Staff/ ATU Galway-Mayo.
11. GMIT Library Online	**The library developed an online library support service for flexible online learners:** • LiveChat implemented since April 2020 • Help FAQs implemented since April available 24/7 • Communication via generic library email: library@gmit.ie • Regular online newsletters Note: The online services are staffed by all library staff across four campuses.	All GMIT Students and Staff/ ATU Galway-Mayo.
12. Remote Teaching Technology Toolkit	Each member of the academic and professional services community in GMIT was supported through the BOLT initiative with a technology toolkit to	All GMIT Students and Staff/ ATU Galway-Mayo. **Supported by the BOLT Initiative.**

	enable online teaching and remote working and student engagement.	
13. Online Labs/Practicals access via elabs Eiricom	GMIT have investigated and implemented a solution across all our campuses where our physical laboratories including 55 labs to date and incorporating 1140 PCs are **available for online and remote delivery of teaching and learning through the Eiricom Connect Software platform.** https://elabs.gmit.ie/EricomXml/index.html	All students partaking in lab-based practicals – allowed students to access computer labs remotely. **Supported by the BOLT Initiative.**
14. Return to Campus Group	A Committee was established to manage the safe reopening of GMIT to include communicating updates with regard the planning for the next academic year to all staff and students, implementing the 3 Step Process prior to returning to campus, and other works (e.g., extra cleaning, installation of extra hand washing stations, completing risk assessment of each area, modifying some workspaces, signage). The aim is to have a safe working environment for staff and students and to keep GMIT COVID-free.	All GMIT Students and Staff **Supported by the BOLT Initiative.**
15. Online Proctoring Project	In 2019-2020 a pilot of online proctoring with PROCTOREXAM (EU company) took place in GMIT School of Business in collaboration with the TLO. The outputs from this pilot were presented in an experience report and case study and this led the way for the Exams Office in GMIT to establish rapid response solutions to high stakes online assessments/exams during COVID-19	GMIT School of Business in 2019/20 and wider impact rolled out in 2020/21 for GMIT high stakes assessments. **Supported by the DigitalEd.ie project and the BOLT Initiative.**
16. First Year Student Induction Course	Developed by TLO and Student Services, GMIT Students completing this course become familiar with GMIT expectations: **who we are; what we do; and how we can help you throughout your time in college.** This course can be accessed here.	First Year GMIT Students/ATU Galway-Mayo **Supported by the BOLT Initiative.**
17. IT Skills Course for GMIT Students	Developed by IT Services, GMIT students successfully completing this course have the **IT skills required to fully engage with distance education in GMIT over the academic year**. The IT Skills course can be accessed here.	All GMIT Students/ATU Galway-Mayo **Supported by the BOLT Initiative.**

5. Feedback from Stakeholder Engagement

By December 2020, the impact on staff engagement and the development of digital capabilities was wide ranging (see Section 5, Impact of DigitalEd.ie initiatives).

In addition, Figure 3 and Table 2 presents overall staff feedback on clinics/webinars provided and how they benefited from the engagement. The majority either agreed or strongly agreed that sessions positively enhanced their knowledge and skills and increased their confidence levels in their ability to teach online or use technology more effectively.
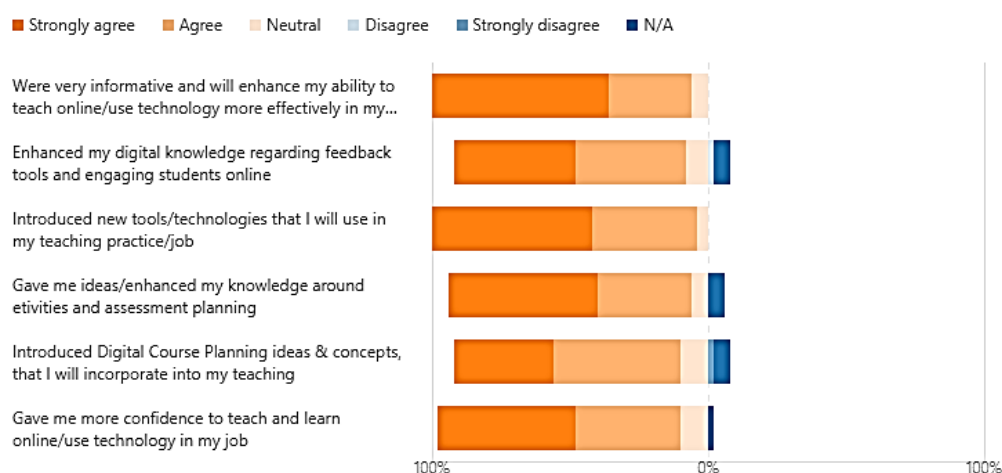
Figure 3: Benefits to attending the DigitalEd development sessions

Further comments are presented in Table 2. The commentary is categorised under the common teaching and learning themes that emerged from the feedback obtained.

Table 2: Feedback commentary and related teaching and learning theme

Teaching and Learning Theme	Commentary
Student Engagement	*"…great variety…atmosphere was very positive and supportive. Some had breakout groups which was great to meet colleagues and discuss…"* *"It was great to get an opportunity to meet other colleagues online and to share their resources and skills. A lot of ideas and tips were also added to the forum and links shared to extra resources was great too. Having the sessions recorded was a positive so the videos are there to go back over…"*
Active Learning Techniques	*"…very well presented and knew the content and how to apply it across disciplines. Also, the opportunity to practise the methods e.g., planning blended learning for modules and spend some time with the technology…Having advice on hand and shared experiences from staff was really useful in getting ideas of how you could apply the methods and technology"*
Peer Learning	*"…highly informative and everyone was very engaged and supportive. I like that nobody felt silly asking the simplest of questions and I hope GMIT continues to host these during 2020/2021 as they are needed"* *"Very good Teaching and Learning Q&A clinics and saved resources provided for follow-up…one-to-one advice would be most welcome heading into Sept 2020 in adapting what we've learned to our modules and individual practices."*
Online Learning	*"…remote access was very convenient and excellent. Content was engaging and input from colleagues highlighted the relevance and application of many elements of the technology to teaching. I felt empowered to engage with online learning technologies in the future"*
CPD Level Communications	*"…well-organised, informative and relevant webinars…there may be value in providing an indication of the level at which each webinar is 'pitched' e.g., level 1, beginner, etc. This might prevent those of us who are just about keeping our heads above water in the digital 'ocean', from that sinking feeling".*

COVID impact on time and teaching practice	*"even though the courses were fantastic, I found it a bit overwhelming with all the information coming at me from all sides every day. I really wanted to complete all the programs as they became available, but it was an impossible task with everything else that was taking place at the same time; student needs, school meeting; Team meeting etc…"*
Supportive Online Learning Community	*"Great to be able to partake of sessions via webinar and to have sessions recorded. Very easy to sign up for sessions, presenters were really good…. created a very good sense of community and goodwill. Even by taking a course that was deemed introductory or basic I learned so much. Leads me to believe there is nothing basic. We all learn something."*
Value of CPD in Teaching and Learning	*"…fantastic to have had the opportunity to uptake so many valuable training sessions. I learned something from each one and really appreciated all the guidance on where to find your level in all this. Also, the obvious sense of community support really felt good! I truly don't know how it was pulled together so quickly…"*

In addition, a focus group has taken place with the CUA Digital Champion community (December 2020) exploring the value and impact of the DigitalEd.ie knowledge platform. The focus group session also explored areas for enhancing DigitalEd.ie and the training and mentoring supports provided during the COVID-19 online teaching emergency.

Under the theme of staff support, 'DigitalEd Show and Tell/Showcase' sessions were welcomed, particularly when themed under topics such as 'technology based assessments' or 'student engagement strategies'. Champions noted, "sometimes a live session is needed more than a demonstration recorded video. Colleagues enjoy asking questions and experiencing the live show and tell". In addition, focus group participants (n=10) also outlined the need to have resources which take into account and promote principals such as Universal Design for Learning (UDL), promotion of engagement through technology and even how assessments are designed online:

"That extends even beyond the whole digital platform. Even in terms of UDL and you know there's people doing really good stuff, but you only find out about it through networking or media sources"

Finally, the participants, highlighted a strong preference for an informal workshop in which people share their experience of implementing a certain digital tool or even their teaching practices which have a type of principle which underpin them i.e. Universal Design for Learning, Student-Centred learning:

"For the last year and a half we would meet up over coffee (now online, previously in person) and it would be very informal with staff speaking for five minutes about their area and what worked well for them from an online perspective and what technologies they've used"

Another example from another participant who outlined the similar approach taken on their campus:

"About once a month with the use of breakout rooms we would have a breakout room for example: business, another for science, engineering etc. where a couple of people could join each group depending on how many people attend and share teaching practice ideas".
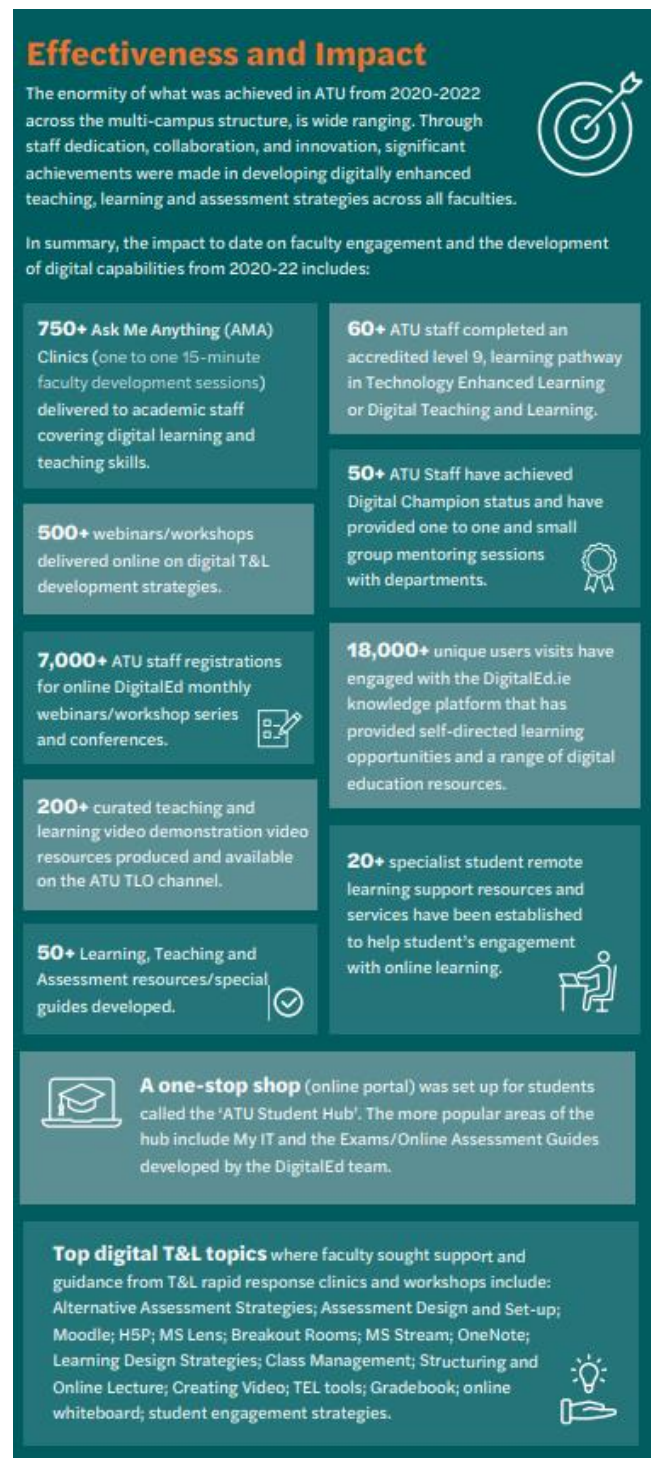
A word cloud presented in Figure 4, highlights the key discussion themes and topics explored during the focus group session and how Digital Champions play a key role in the ongoing enhancements to the DigitalEd.ie knowledge platform and associated services and resources.

Figure 4: Key discussion topics and themes explored in the Digital Champion focus group (December, 2020).

6. Impact of DigitalEd.ie Initiatives

Through dedication, collaboration, and innovation, ATU transitioned teaching, learning and assessment online smoothly. The scale of what was achieved and its alignment to digital transformation strategic objectives, has the potential for transfer of learnings to other higher education institutes in Ireland and internationally.

By June 2022 the impact on staff engagement and the development of digital capabilities was wide ranging is outlined in Figure 5.

Figure 5: Effectiveness and impact of DigitalEd.ie learning pathways and resources (Ginty, 2022).

A stand out initiatives from the DigitalEd project is the creation of the Digital Champions program. There are currently 50 digital champions across multiple departments and all sites of ATU who have completed the digital badge learning pathway. The academic digital champions provided guidance and shared exemplary practice in digital teaching and learning with their academic colleagues. This support was invaluable during the global pandemic. All digital champions completed an accredited level 9, learning pathway in Technology Enhanced Learning or Digital Teaching and Learning, and also provided mentoring to their academic colleagues.

Several of the digital champion success stories is documented in the DigitalEd book of cases (see https://DigitalEd.ie/book). An example of the digital education technologies introduced by the champions include the following:

- TEL tools to engage students in online classes (Menti, Padlet, Kahoot, Vevox etc.)
- MS Teams for live class delivery and creation of an online learning community.
- H5P to create interactive content.
- MS Lens for Online Exams.
- Advanced MCQ for online exams.
- Digital Badges.
- Flipgrid, OneNote and Pebblepad ePortfolios.
- Panapto/Camtasia for video editing.
- Redesign of assessment strategy using appropriate technology.

It is intended that this digital champion model will continue to exist and grow across the ATU, providing guidance to HE educators in the area of digital teaching and learning and showcasing exemplary practice.

7. Conclusion

Extraordinary goodwill was demonstrated by those who teach, learn, support and lead in Atlantic Technological University (ATU), and much was learned for the future in our digital transformation development journey. A cycle of continuous improvement in digital education is ongoing in ATU, through action research studies underway on the initiatives outlined in this paper, and from reflective evidence generated from a wide range of stakeholders. This is critical to our digital transformation journey, which is current today, but it will also be crucial in the post-COVID-19 context, in which the use of blended and online learning is only expected to increase in ATU and across the higher education sector globally.

Key learnings from the journey to date include:

- Undertaking the digital capabilities audit and evaluation in June 2019, proved invaluable to designing a platform for digital education to support higher education staff.
- Creating a suite of Learning, Teaching and Assessment (LTA) resources for managing the online learning environment, provided much needed support to fill the gaps of knowledge with regards teaching and assessing online.
- Conducting regular open clinics and discussion forums with colleagues and gaining feedback on where they needed the most help, informed the development of various guides.
- Establishing the BOLT steering group, representing a wide range of disciplines and functional areas in ATU, resulted in the rapid rollout of a range of supports for staff and students.
- Creating a Digital Champions team co-ordinated by the Teaching and Learning Centre, provided representation across every discipline and 'a mentor' to help navigate the challenges with moving online across all academic departments. The network is proving invaluable and

has resulted in ATU gaining a wider reach and increased engagement in building digital capabilities and developing alternative assessment approaches.

- Feedback from colleagues through various surveys and focus groups in 2020-2022 have provided evidence on the value of 'Learning and Teaching Showcase Events and Forums', where lecturers show and tell what is working well and what is not working well. This peer learning, collaborative forum facilitated by TLC, has proved to be a supportive and collegial network and has helped build confidence among the academic community in teaching and assessing in the online learning environment.

- Recruitment of a team of graduate student mentors has been a great success and each Head of Department (HoD), the teaching teams and the students have benefited from their involvement. Graduate student mentors have played a key role in creating a sense of belonging and retaining students in the online campus. They acted as 'trouble shooters' working with HoD's and student groups from first year to final year.

- Providing for self-directed and directed accredited digital teaching development courses provided 'choice' and 'options' for colleagues and enabled lecturers to engage with learning over the summer months (see Figure 6 & 7).

- Providing for a monthly TLC timetable of workshops and drop-in clinics has been warmly received by the academic community, and this has led to the development of a 'teaching and learning services module design model' that provides support from concept, right through to the build, design, and implementation stage (see Figure 8).

Figure 6: Self-Directed Digital Development Pathway
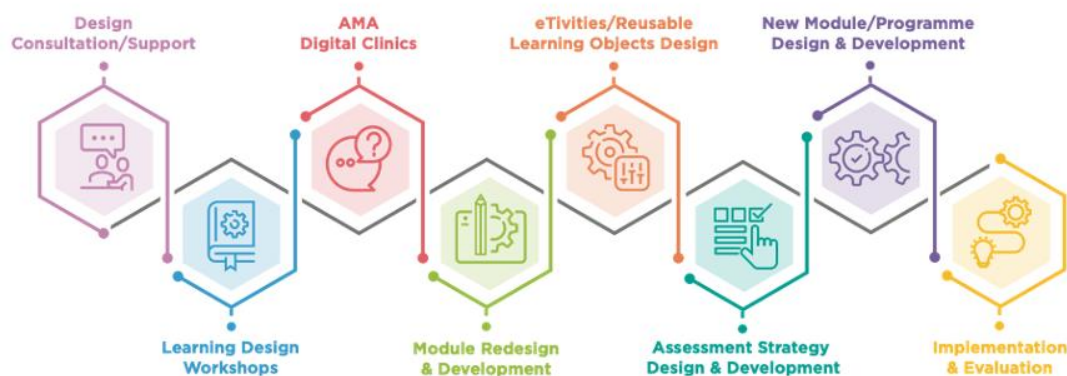
Figure 7: Accredited Digital Development Pathway

Figure 8: TLO Module/Programme Development Services

To conclude, the DigitalEd.ie knowledge platform and associated COVID remote teaching and learning services implemented in Atlantic Technological University 2020-22, has accelerated the rate of teacher engagement with digital education and technology enhanced learning tools. As a result of staff upskilling in digital education, students have also benefited from this, through the range of digital engagement and learning tools (i.e., live class discussions, group work, group discussions, polls, quizzes, icebreakers, presentations, clinics, and social activities), that they have been exposed to, and all of this will support them in further education, employability, and the world of work.

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Futures thinking and long-term challenges for energy engineers: the practical case of the InnoEnergy MSc Energy for Smart Cities Moonshot pilot at BarcelonaTech (UPC)

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Abstract

The term "Moonshot Thinking" has become popular in the last few years and represents pursuing objectives that appear undoable, but it could redefine humanity if implemented. It should tackle enormous societal challenges in the long term and shape desired futures in the process. The urgency of climate change, the upcoming challenges, and the required outcomes make the energy domain an ideal field for applying this methodology. Therefore, the InnoEnergy MSc Energy for Smart Cities Moonshot pilot subject was implemented in the Master's program during the second year at the UPC in Barcelona. This project-based course aims to provide the students with skills in new project management methodologies, futures thinking, innovation, problem-solving, and rapid prototyping while addressing a huge problem in the field of energy and sustainable cities. The paper describes the design of this challenge-based course, discussing the experience of the two years of piloting implemented at the UPC, including the feedback from the students.

Keywords: Innovation, Moonshot, Futures Thinking.

1. Introduction

It is expected that 85% of the jobs necessary for 2030 still don't exist yet [1]. Consequently, higher education institutions are required to start a revolutionary, disruptive process to adapt the study plans to the skills that the future will require. Future scenarios foresee that part of the workforce will be displaced by automation; nevertheless, new functions will be needed, which cannot be masted by automation, AI, and robotics. Experts have been discussing those skills, and a general consensus about these skills includes leadership, design, human meta-communication, critical thinking, cooperation, emotional intelligence, creativity, ideation, and innovation [2].

Policy papers such as "The Future of Education and Skills" by the Organization for Economic Co-operation and Development [3] state that education institutes should also prepare students on how to navigate uncertainty, act responsibly, and foster the well-being of individuals, communities, and the planet.

Under those perspectives and recommendations, in 2020, the Moonshot pilot was created by the Universitat Politècnica of Catalunya-Barcelona Tech (UPC), and supported by the European EIT organisation InnoEnergy, fostering students' education in that direction inside the MSc Energy for Smart cities program. This program counts on the collaboration of Fab Lab Barcelona for the rapid prototyping part.

The Moonshot was what took humanity boldly into space to plant a footprint on the moon. Decades later, Moonshot thinking is now the philosophy to take on a huge problem – such as climate change – ideate radical options and use disruptive technology to find solutions. The course was created with the basic principle that making something 10x better is often easier than making it only 10% better. To reach this target, students need to test out their most revolutionary ideas with high goals and tight deadlines – testing prototypes with the intent to fail and then using that failure to build the next prototype significantly better, always without losing the ethical focus of the impact that the ideas and projects will have in the planet and societies.

2. The moonshot program at BarcelonaTech-UPC

This course's main objective is that students go through the process of moonshot thinking and learn about the different stages of this methodology. The student should acquire knowledge about the methodology, essential skills for applying the methodology, and autonomous decision-making.

The subject is a semester course organised as a challenge of 15 ECTSs and consists of different blocks, depicted in Fig. 1.
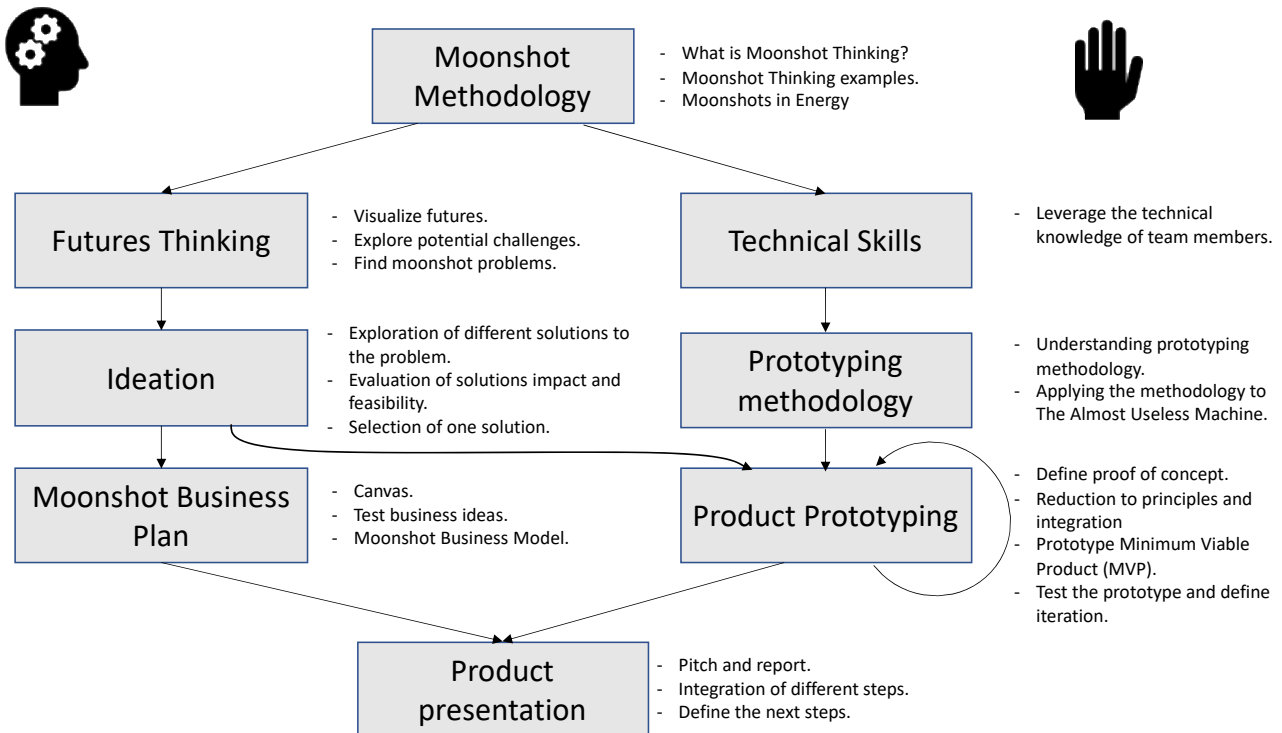

Figure 1: Overall methodology at the Innoenergy UPC moonshot course.

The subject starts with a block on introducing Moonshot thinking and the philosophy behind this methodology. Examples are given, and references to existing projects (also in the energy business) are discussed. After the introduction, the subject divides itself into two parallel tracks: one focuses on brain activities (Futures Thinking, Ideation, and Moonshot Business Plan), while the other is focused on hands-on activities (Technical Skills, Prototyping Methodology, and Product Prototyping).

The brain activities start with Futures Thinking. Concepts such as different futures, weak signals, moonshots in the electric grid, the Sustainable Development Goals, exponential technologies, urban futures, and activities such as describing the future or asking "How might we..." questions were done. This phase provides the students valuable insights into the huge problems in the energy sector in the future, particularly in the scope of the 2030 to 2040 decade. The students may be able to choose a specific topic they should work on in groups of 2 to 4 students. The second block is devoted to the ideation process, where the selected scenarios out of the future thinking are converted with design thinking methodologies into nearer-defined but also disruptive ideas without jeopardising the students' creativity. The third block introduces several business model canvases using practical examples and case studies. The outcome of this block is the ability of the students to transform disruptive ideas into business opportunities by using a methodical approach.

The hands-on activities start with the delivery of introductory sessions on rapid prototyping technologies (AI, digital fabrication, and electronics). Following a practical session on the prototyping methodology but not applied to the specific idea. The outcome of this block is to transmit (only) the knowledge and ability of the student of rapid prototyping technology as well as practical implementation. The last block is devoted to prototyping the specific idea from the ideation process and evaluating the design, including the future potential of the idea, the business dimension, testing the prototype developed itself and iterating.

The course closes with the project presentation in front of a jury with some external members. The students deliver, at this point, a pitch and report about the moonshot project, including the process steps. Special attention is given to integrating different steps and future work. The course evaluation is based on the partial and final documents delivered, the final presentation, and the student work and implications during the semester.

3. Implementation of Futures thinking, ideation, and business plan

3.1 Futures Thinking and Ideation

Generally, challenge-based learning (CBL) follows a present-forward approach. In this type of project, today's challenges are explored in search of solutions that, it is hoped, will be resilient and robust enough to last. In Moonshot thinking, the methodology is reversed, meaning we start by imagining a possible future and work backwards to the present. This way, challenges require long-standing solutions, which exponential technologies will often nurture. [4]

The soft skill of exploring and identifying possible futures, known as futures thinking or foresight, is essential for entrepreneurs and companies that want to impact the future, pursuing what is known as disruptive innovation. The future cannot be controlled or predicted. However, how the future is imagined can influence our present attitudes, behaviours and decisions, ultimately shaping how the future unfolds. In some form, the future always exists in the present.

Futures thinking is an imaging technique for exploring the unknown universe of possibilities and opportunities ahead of us while highlighting potential risks. The all-encompassing term "futures" is used because today, there is no "one" correct future; they are all more or less possible, hence the plural form. Foresight is a way of inspecting our beliefs, facing the limitations of current conceptions and revealing the trends and weak signals that we believe can shape the future. [5, 6]

For over twenty years, futurists have proposed three kinds of futures: possible, probable and preferable. However, this three-part taxonomy is increasingly expanding to include more types of alternative futures. The Cone of Plausibility presented in Figure 2 includes, in addition to the three previously mentioned, plausible futures and concepts such as wild cards or black swans. [7, 8, 9, 10]
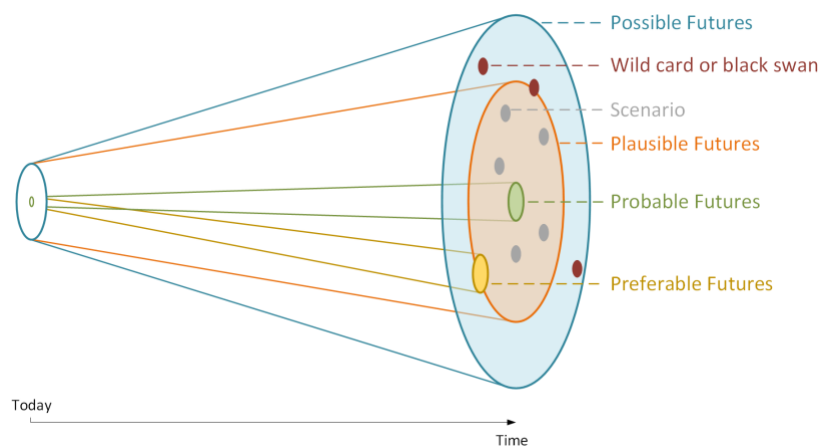
Figure 2: Different Futures treated in the Futures Thinking block.

In the Moonshot Project futures thinking block, we follow an inside-out approach. First, students explore probable futures by building on current trends. Multiple research resources present information on the direction and strength of these trends. Probable futures, those we think are likely to happen, are outlined by extrapolating current trajectories, assuming that the future will unfold similarly to past events. In this phase, activities are conducted to explore trends, such as horizon scanning. Next, students dive into plausible futures, which we think might happen based on our understanding of how the world works. Through scenarios, narratives that offer a plausible unfolding of events are developed around a series of alternative futures. Finally, the spectrum is broadened to think about possible futures. To do it, we introduce wild cards (or black swans), seemingly improbable events that would have a meaningful and highly disruptive impact. Throughout the process, exercises that encourage the creation of "mini-worlds" are followed, providing a more holistic view of the future, which is necessary when addressing systemic challenges [5, 10].

Once all the different futures of the cone of plausibility have been explored, the students define their preferable future, a future that should or ought to happen. Afterwards, following the *backcasting* methodology, students work backwards from that vision to the present day, highlighting the differences between the current situation and the long-term vision and finding areas in need of disruptive innovation [5, 10, 11, 12].

For this stage, some resources of the Joint Research Center of the European Commission are used. To explore probable futures, the exploratory workshop "Working with megatrends" is conducted, in which the students choose a topic of interest and explore the impact of different megatrends on it. Also, the students explore plausible futures in sustainable cities through the role-play simulation tool "The Scenario Exploration System (SES)" [13, 14].

Due to the backcasting methodology, the students need to encompass the long-term vision of the plausible future with the short-term vision of today's action. In practice, the full potential of this methodology is limited by some practical constraints, such as the limited duration of the project and the subject (one semester) and the learning objective of developing prototyping skills.

3.2 Moonshot Business Model
In the process of bringing a Moonshot idea closer to reality, we want students to walk the extra mile and explore the exploitation of potential results from a business perspective.

In the pilot test run, we aimed to connect the most common management tools with the Moonshot Thinking concept and "*disruption*", inspired by some definitions. First, Google X [15] identifies their moonshots "*at the intersection of these three ingredients:*

1. *A huge problem in the world that affects millions or billions of people*
2. *A radical, sci-fi-sounding solution that may seem impossible today*
3. *A technology breakthrough that gives us a glimmer of hope that the solution could be possible in the next 5-10 years*"
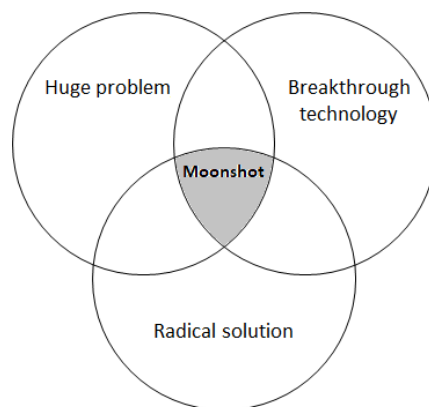
Figure 3: Visualisation of the Moonshot concept at the intersection.

This practical definition already introduces basic business concepts. We can assimilate a "*Huge Problem*", as a "*market size*" indicator, a "*Radical Solution*", described in terms of a "*business model*" and ecosystem based on a "*Breakthrough Technology*" or converging technologies [16].

Another source of inspiration has been the etymological definition of the verb "*disrupt*", which can be understood as *"break or burst asunder, separate forcibly"* or "*break apart, split, shatter, break to pieces*" [17]. This concise definition has profound implications for how we conceive a Moonshot idea and the tools we need to work on it. We have combined many existing tools in such a way that the complexities of the project can be addressed at a glance: the Moonshot Business Model.

In the process of working with the definitions, we came up with a set of crucial ideas/questions:

1. *You can only disrupt something that already exists.*
2. *In what pieces do we break the existing solutions?*
3. *Do you disrupt, or are you disrupted?*

You can only disrupt something that already exists. Although the statement looks obvious, it unveils that disruptive solutions satisfy a need that was already required and met before in a different way. In literature, we refer to this "need" as "*Job-To-Be-Done*". Osterwalder divides the concept of *Job-To-Be-Done* into three categories [18]: functional, emotional and social. For instance, early computers disrupted the abacus in doing calculations. We can think of "*Doing calculations*" as a functional JTBD, pre-existent with the launch of early computers. However, the techies' community could think of computers from a social or emotional perspective. In that sense, we cite a definition of JTBD [19]: "*JOBS-TO-BE-DONE is best defined as a perspective — a lens through which you can observe markets, customers, needs, competitors, and customer segments differently, and by doing so, make innovation far more predictable and profitable.*"

Building on the previous example, a computer today satisfies many JTBDs, not just doing calculations, for instance, "*preserve our privacy*", "*supporting communications*", "*entertainment*", etc. The students can formulate their own JTBD after an ideation process when they have expanded and narrowed down the topic enough. By reaching this point, they have also run an exhaustive search for the existing solution providers for the same JTBD. Therefore, at this point, the students should ask themselves, "*who or what are we disrupting?*" already knowing the current solutions in the field.

In the search for solutions, the students iterate the formulation of the JTBD. Let us mention one particular case from the pilot test. The students were concerned about "high temperatures" in cities, which could make them hardly liveable and walkable. After discussions and an exhaustive search, the JTBD definition evolved from "*high temperature*" towards the "*high thermal sensation*", which is relatively not the same, despite being strongly related. With this new formulation, the students were able to look at the problem from a different, broader perspective and consider a lot more solutions potentially to be disrupted.

The Moonshot Business Model includes one section that covers the formulation of the JTBD and the search for existing solutions and their main shortcomings. It is essential to highlight the difference between "*Product/Service*" and "*Value*", meaning that entirely different products and services can provide similar value. Possibly, this is an excellent risk for incumbents: the appearance of a substitute solution can arise from random domains that were not on the radar of the firm.

In what pieces do we break the existing solutions? The students are confronted with understanding the incumbents' business model, which can be seen as breaking it into (organised) pieces. Probably, the most popular tools are the Business Model Canvas from Osterwalder [18], the Business Model from Gassmann [20] and Porter's Value Chain [21], as different ways of modelling the operations of a firm. The students not only practise modelling the incumbents' business model (for analysis purposes) but also get handy at designing new ones and introducing variations.

Disaggregating a business model in elements allows rearranging (some of) them to form different, innovative business models, also known as "*pivoting the business model*" [22]. In this pilot project, we have run iterative mentoring sessions to discuss the main elements of the business model canvas in combination with the Value Creation Ecosystem (VCE) [23]. After a couple of mentoring sessions, the students are able to produce coherent changes in the ecosystem and the business model.

The VCE diagram consists of blocks and arrows displaying the main stakeholders and their value exchanges. This tool has become very intuitive for students to understand the relationships with close stakeholders. While this option remains adequate for visualising the mechanisms of pivoting, for future editions, we also consider introducing the St.Gallen Business Model Navigator [20, 24], which has collected 55 business model patterns that can apply to different domains for exercising business model pivoting.

Do you disrupt, or are you disrupted? This question stays rather general, but it introduces some notions about competition and strategy. The classical tool for analysing competition and finding niche opportunities is Strategy Canvas, which is a rather visual tool. Still, it would require the students to perform an extensive market analysis.

Building on the computer example, abacus manufacturers were incumbents in the "*doing calculations*" JTBD market. In contrast, at that time, disruptive computers could be understood as an unfinished "*substitute solution*", using Porter's Five Forces terminology [25]. But the notion of an "*unfinished*" solution opens up the

possibility to introduce fundamental concepts related to the evolution and maturity of the solutions, such as the scales of Technology Readiness Levels (TRL), Gartner's hype cycle [26], the technology adoption life cycle or the life cycle of a startup. The democratisation and the convergence of many breakthrough technologies at a falling cost [27] increase the chances of disruption while shortening the cycles mentioned above.

Bofarull [28] proposes a methodology for incumbents to map the risks of being disrupted and spot opportunities. This methodology is based on an in-depth analysis of the different JTBDs they cover. The methodology keeps the three dimensions of the JTBD: functional, social and emotional, while considering early signals of rising or extinguishing trends (Zero to One [29]).

However, in the pilot test, we focus on the management tools and methodologies for innovators (Lean Canvas [30], Lean Startup [31], etc.), which are helpful in deploying radical solutions, regardless of the degree of disruption. Many of these methodologies focus on removing as much uncertainty as possible at the minimum cost while deploying a solid competitive advantage. At this point, the students are in the position of connecting the dots: they apply their prototyping skills from Fab Lab to articulate a business idea, which in turn came from the Futures Thinking methodologies.

The Moonshot business model sessions take place in parallel with the prototyping phases. This implies that, for a few weeks, the students simultaneously work on two completely different topics. The mentors for prototyping and business development aim to bridge the gaps between both domains. This way, the mentoring sessions become vital for achieving the proper alignment of efforts.

We found out that the relevant disruptive solutions, such as Hyperloop or SpaceX, are driven by ambitious targets on functional performance, for instance, the speed requirements for the Hyperloop capsules (between 1,130 and 1,220 kph [32]), as well as operation cost targets "*[...] gives a total of $20 USD plus operating costs per one-way ticket on the passenger Hyperloop*" [32]. In the case of SpaceX, NASA has already paved the way [33] *"NASA's goal is to reduce the cost of getting to space to hundreds of dollars per pound within 25 years and tens of dollars per pound within 40 years"*, while SpaceX is contributing to it [34]. While these projections are unfeasible for an academic project with a duration of a few months, they become self-imposed goals aiming at fostering ingenuity and creativity in the solutions [35].

By the end of the course, the students had undergone a very heterogeneous program, which involved a technology search, a market analysis, business modelling, etc., but also a prototype. Very soon, the students realise the many design ramifications, for instance, technical challenges, usability challenges, business challenges, etc. The students end up building a system with many sub-systems, technology tricks, pieces of code, structures, etc. It is important that students realise the know-how that they have generated in the process because some of this know-how could be later on exploited in different, unexpected ways. Similarly, implementing the Bitcoin moonshot idea produced as a by-product, blockchain technology is finding its application in different fields beyond monetary purposes [36].

The last part of the Moonshot business model covers these aspects: the solution description, the identification of the elements, as well as the projections from a technical and economical point of view. Unfortunately, in the pilot test, we ran out of time to study alternative exploitation modes. However, we had time to connect the findings from the students' prototypes (and their shortcomings) with the market segments they had selected. This way, the students were one step closer to building viable business models and, at the same time, they could spot some barriers to growth.

4. Implementation of Rapid Prototyping

Moonshot thinking is an agile methodology based on generating solutions quickly, testing them, making them fail, iterating and repeating the process until finding a foolproof solution. It is assumed that this solution will not always be found, although the learning that emerges during the process is equally or more valuable.

In a project of X, the Moonshot Factory, this process can take between 5 and 10 years. Since the Moonshot Project course runs for approximately six months, this process has to be condensed, trying to offer the student the closest experience to that of a moonshot project. Thus, once the futures thinking and the ideation seminar have been completed, students are introduced to the rapid prototyping methodology to make a proof of concept. Finally, students design experiments to test their solution and report on how they would proceed in the next iteration. During this process, the course counts on the collaboration of Fab Lab Barcelona, which provides its facilities, knowledge, and methodology developed within the Master in Design for Emergent Futures (MDEF) programme.

4.1 Capacitation and the almost useless machine

MSc Energy for Smart Cities students may have slightly different backgrounds, and although some may have done prototyping in a course or for a personal project, this is not the norm. Hence, the first step before entering the Fab Lab is to equip students with the basic knowledge of the technologies they may need. Although there are many different prototyping technologies, considering the context of the master's degree and the topics of the projects, there are three that are introduced: CAD design, Arduino or electronics platforms and machine learning or data science. These introductory sessions are given before entering the Fab Lab by UPC professors or PhD students. They are intended to familiarise them with the technologies they may need to develop the proof of concept of their project.

The next phase is held in the Fab Lab and aims to familiarise students with the manufacturing environment and technologies. This module, known as "The Almost Useless Machines" (TAUMs), consists of a hands-on, 3-days intensive introduction to fabrication, physical computing and the Fab Lab environment. Students go over the basic skills needed to design, develop and manufacture almost anything in a Fab Lab. At the same time, they also learn how to properly manage time and resources to perform successfully in a prototyping sprint [37].

TAUMs learning methodology seeks to inspire and motivate the students to use the possibilities of digital manufacturing and technologies to prototype, design, fabricate and program an "honest" mechanical artefact that "makes" something. Following the spiral model approach, this module encourages participants' creativity and imagination and stimulates the search for tools and solutions. But why "almost useless machines"? As existential purity, building machines with no apparent purpose allows the designer to focus on mechanics and movements, allowing more freedom to simplify actuation, forgetting about constraints. The metaphor of machines and artefacts doing constant predefined or random movements is what Fab Lab Barcelona call Useless Machines [38].

4.2 Moonshot prototype

Once students are familiar with prototyping technologies and the Fab Lab environment, the process of the Moonshot prototype begins.

Typically, solutions to Moonshot problems are complex and require years of dedication, investment, and technologies that may not yet be sufficiently mature. In the Moonshot Project, students have two sprints of

about 25h each, so it is almost impossible to prototype the solution they devised. Hence, they are asked to fabricate a proof-of-concept or a representation of how their solution works.

For this phase, Fab Lab Barcelona proposes conducting an Immersive Learning Experience program in its "Accelerator & Prototyping Program" modality, which provides the tools and skills for launching participants' ideas into the future of digital fabrication and distributed manufacturing.

This customised program includes mentoring sessions with a selected team of Fab Lab experts, aiming to identify how technology, design and data can be chosen to tackle the problem, taking into account existing knowledge and available resources. Also, the prototyping experience is divided into guided and autonomous sprints. Hence, students feel supported throughout the process and gain the experience and confidence to apply prototyping in their future personal endeavours. Students are asked to document the fabrication process at this stage, writing down the problems and challenges they encounter and their decisions.

Figure X shows the prototype of the Moonshot Project of the 2021-22 course with the name "Kinetic Solar Shading System with PV Panels". The model was a small-scale representation of their solution. Although it did not have all the features that the final product should have, it included some mechanical functionalities that helped to understand the group's idea.
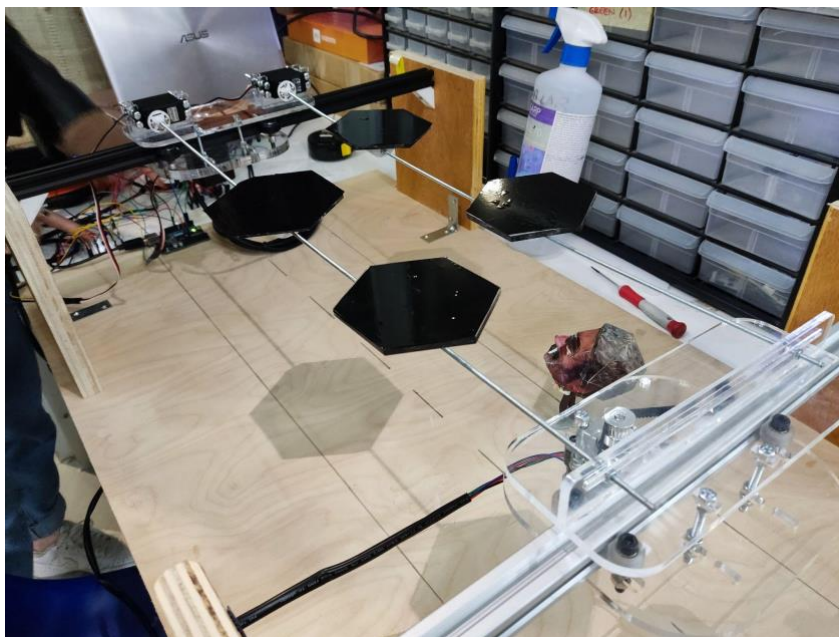
Figure 4: Moonshot Project prototype. Project "Kinetic Solar Shading System with PV Panels".

Finally, the students have to define some tests to see how their prototype responds, with which they have to collect feedback and think about how it could be improved in the next iteration. For the final report and presentation, they are asked to describe the whole prototyping process, the challenges encountered, the tests run, and the insights obtained. It is also asked to describe the next steps they would take if the project had a longer duration and what changes they would introduce in the following prototype.

5. Conclusions

This paper presents the methodology and the first outcomes of a pilot course implementation on Moonshot Thinking for an engineering degree related to energy at BarcelonaTech-UPC in Barcelona. The core philosophy of the course is challenge-driven, with some particularities inspired by the Moonshot Thinking process.

Namely, the activities related to Futures Thinking, Ideation and Business modelling, as well as the hands-on prototyping section. This course was taught for two years, in 2020 and 2021, and it is now in the third edition in 2022. The overall implementation experience in almost three years is that the student's motivation for the course is generally high. The course, as presented above, implies, by definition, a combination of diverse skills and disciplines paired with autonomous decision-making from students during the project. This implies both high flexibility from the students and the teachers to keep the project's overall objective in mind. From the student side, the capacity for the combination of different skills in an interdisciplinary manner is particularly demanding.

Moreover, the students are challenged to propose ideas that should be out of the box, which is in some sense the opposite of what students have to do in most subjects in their studies. From the teacher's point of view, the number of different activities requires effective planning of the different sessions and steering the diverse decision processes accordingly. A high level of mentoring as well as interdisciplinary skills are required from the teachers.

The overall subject assessment is positive, and the potential for implementing this approach is high, not only in the engineering sector. Potentially, a higher diversity of the student's profile will also lead to a more diverse outcome in terms of the result; however, it could potentially also increase the complexity. The future activities will be focussed on seamlessly systemizing the futures thinking, ideation and business modelling process and open it to a wider variety of students.

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How to build your innovation methodology. The Innovation Toolbox

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Abstract

While innovation has become a hot topic in higher education, the need of a systematic approach to the diversity of innovation methodologies is a pending issue. The goal of this paper is to present a summary of the existing innovation methodologies and their relation to the point of the value chain where they achieve the best results. The idea is to consider all innovation methodologies as "tools" in the sense that they can be taught and learnt independently, regardless of the level of creativity of each one. The Innovation Toolbox is the result of this approach and intends to simplify the application of the existing innovation methodologies with the goal of achieving the most successful results depending on the point of the value chain where the innovation is pursued.

Keywords: innovation, innovation methodologies, business model, value chain, design thinking.

1. Introduction

Innovation has become a frequent word that states much more than the need of novelties that our system seems to ask for permanently. It is an essential element that is requested in almost anything in our society and also as individuals. When applied to organisations, examples tend to associate great innovations to very special persons with innate abilities. With a superior gift. Like genius. Beyond this, there are also methodologies that allow everybody the capacity to innovate with the appropriate training. Essentially this is what this paper is about: to show which elements may be useful to be applied when an innovation challenge is required. Depending of the type of challenge some instruments may give better results than others, and this is why we need to discriminate, first of all, the most useful tools.

2. Why the concept of tool applied to innovation

If everybody can innovate, the question is how to make it feasible in a successful way. Here the concept of tool is relevant. First of all because it allows discriminating what are not tools in the sense of what is relevant when we want to apply it to innovation methodologies. The advantages of a tool are: you can treat it like an instrument, they are useful, you can learn how to use them, you can do it repeatedly and they are versatile in the sense of being able to solve new problems. In consequence, all the innovation methodologies that have those characteristics have our consideration of tools and, as a result, they can be taught, used systematically, practical and ready for facing new challenges.

3. What we understand as innovation

If innovation is the purpose of the tools we are selecting, it is important to agree on the meaning of innovation. Beyond a definition there are five main elements that we consider an innovation must have if it is to be considered as such:

> 1.- A solution (to an existing unsatisfied need or desire, known or not),
> 2.- A novelty (at least for the chosen market),
> 3.- An added value (in the sense of increase of gain),
> 4.- An offer (considered as delivering a product or service)
> 5.- Economic viability (with financial sustainability).

In a short, a possible definition could be: an offer that gives a solution to our market with novelties that provide an added value in an economically sustainable way. Our approach is founded on this basis.

Thus, innovation starts when an unsolved need is identified, and the solution is new, at least for the addressed targeted market. In consequence it is not necessary to be new to the world (in this case we were talking of invention) but identified as new for the chosen market. The solution must be concrete (a specific product or service) and provide added value to addressees and to stakeholders in general. Stakeholders may be profit or non-profit organisations, but in any case it must generate value. At this point it may be relevant to consider who decides that a value is generated. For profit companies in a market economy it is obvious: is the market itself by the act of buying. For non-profit organisations, the values of the society where the innovation is offered are the main factor and may be expressed by different ways and platforms. Incentives for innovating in education institutions have not been very high and new education methodologies still have an small impact, especially in higher education.

The economic viability of innovations is essential, as far as the objective of the solution is to generate value that should be appreciated in some way, if not, no stakeholders will be interested. Aside from that we must take in account that innovation is a team sport, so when applying innovation methodologies the role of the team involved will be determinant. The team element is also present in academia both as cooperation and as competition.

4. The importance of the value chain

Some tools are better than others depending on purpose and, consequently, not all the innovation methodologies provide the same result. This is in correlation with the point of the value chain where they are based. In fact, the effectiveness depends on the focus of application. As a simplification, we can establish four foci of innovation according to the following graphic of the value chain:

Figure 1: Focus of Innovation according to the value chain

Each one of the four foci of innovation showed in figure 1 can be split into many other categories that may also be linked to different innovation challenges.

The purpose of an innovation is to be useful to somebody that applies it because it contributes to an increase of his gain. How this increase of value is generated depends on which part of the value chain we are focussing on. If we want to increase the user experience, we are focussing on the consumer part and the most reasonable will be to use the methodologies that fit the best in this area of value creation. If we want to increase the value generated in the area that allows more quality in the production phase, or fast provisioning and supply avoiding wastes in procedures, then the focus will be in the operations part of the value chain. If the objective is to increase the value offered by increasing the performances or features of the product or service, the best will be the suitable tools for this part of the chain.

The assumption is that not all the methodologies have the same results because they have a predominant focus on some parts of the value chain more than in others. This close correlation between innovation tools and value chain is one of the essential elements of the idea of building a system that facilitates the approach to innovation challenges of any kind. And this happens if we are able to define previously in which parts of the value chain we want to work.

With this idea in mind we have seen that some innovation methodologies provide better results if they are focussed on some parts of the value chain better than in others.

5. The innovation methodologies

Thus, when the general situation of the world economy caused a huge increase in demand, the focus for finding solutions was on production. In consequence, many innovations were generated to solve this bottle neck. When offer saturation arrives, the focus of competition moves to consumers as it becomes more important to understand their needs. Just as examples of the correlation between innovation methodologies (or tools) and its focus in the value chain, we have selected the Lean Management principle, formerly named Lean Production, (as a simplification of the developments based in W. E. Deming contributions) [1] as the most effective if the focus is on the operations part of the value chain. The different approaches at many levels of analysing what gives value and what doesn't have enriched enormously the constellation of options in this part of the value chain. Toyota still is a great example of this, but also Zara, in the retail sector of clothes and fashion. Until that moment, in the market where Zara rivalled, the competitive advantage was mainly based on design, branding, marketing and price but not on the operations part of the value chain. The Zara success case is an example of innovations that have been imported from other markets and sectors.

As an illustration of innovation tools based on focusing on the part of the value chain closer to the creation of product and services we have chosen more complicated methodologies like TRIZ and ARIZ, or the simplified version, SIT [2]. Systematic Inventive Thinking (SIT) has five tools that correctly applied to the basis of the previous definition of the internal and external elements of the universe where the innovation is asked for, are capable of creating unexpected solutions. If "thinking *outside* the box" is a frequent sentence to encourage innovation, in this methodology, the opposite is the basis: the most surprising and feasible results will come from "thinking *inside* the box". These tools are less known than Lean Management but extremely effective when you are able to define a closed world with all the known elements that are involved in the problem, but also in the solution. When it is not possible to define this closed world, because the uncertainty is extensive, these methods are less powerful. Almost all startups are in this situation of uncertainty. As well as many intrapreneurship initiatives that aim to be disruptive.

In these situations, the Lean Startup is the tool chosen, because uncertainty is great and it is not yet clear how to deal with clients. At this point we are mainly focussed on the market part of the value chain. This methodology was originally created to provide entrepreneurs a new systematic approach that traditional

business management may have considered useless and unrealistic. But now, big companies have discovered the great advantages of being fast, agile and frugal and are quickly introducing the Lean Startup methodology when they want to innovate while reaching the market in the most efficient way. With no mention to the new set of concepts that this methodology, thanks to Eric Ries [3], has provided to management.

When we focus on the consumer part of the value chain, the chosen tool is Design Thinking [4]. Much further than the traditional way of innovating based on what consumers more or less explicitly wanted, this methodology demonstrated the approach of analysing the broad world of the consumer, satisfying even what they didn't consciously know they needed or desired.

In figure 2 there is a summary of the correlation between the Innovation Tools and its corresponding value chain focus:
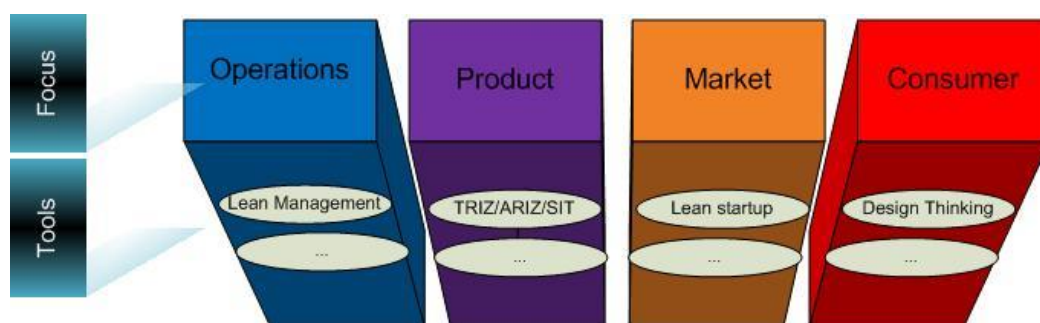
Figure 2: Innovation Tools and value chain focus

Note that this approach is a remarkable simplification and, of course, there are no strict limits within the classification of the correspondence between the innovation methodologies and the part of the value chain where they have been placed. Even if this is not an inventory of innovation methodologies, we assume that the initial statement of the tool concept gives no room for some proposals that have been discarded, like the Blue Ocean or the Open Innovation, for example. Our arguments for that are based on the consideration that they are more a strategy than an instrument (Open Innovation) [5] or an ex-post analysis with difficulties for further replication (Blue Ocean) [6].

6. The Business Model as an innovation tool

One common definition of a Business Model is that it represents the description of how an organization creates, delivers and captures value. This concept is often used to describe business as well as to explore new opportunities for companies. In many cases the innovation generated has been based on a new approach to the existing business model. In that strict sense, there is no doubt that the Business Model, itself, is a tool to innovate. Probably the success of Nespresso is more based on their innovative business model, in relation to their market segment, than on the patented (and later copied) coffee caps. In fact, many innovations in any part of the value chain are because there is a successful business model holding them up. Otherwise, the business model may be a tool to increase the results of any innovation because it may act like a booster since it integrates all the elements of the value chain, its corresponding stakeholders, showing how the added value is generated and distributed. The A. Osterwalder and Y. Pigneur contribution [7] with the Business Model Canvas fits well in our vision as it integrates in a single vision all the elements involved in the value creation helping to provide inputs that can increase the positive effect of any innovation.

In addition, it contributes to supplying more innovation elements to companies in the permanent challenge of finding new competitive advantages but also to reinforce them in the way that L. Keeley [8] described as

the more successful companies in the long run are the ones that succeed in simultaneously incorporating more than three innovations from the ten types he identified.

7. The Innovation Toolbox

Once we agree on what innovation means and that tools are a practical approach to face challenges, we open a virtual box and select which instruments will serve the original purpose and discard the others. All innovation methodologies, including the ones to come, may have effects in all the value chain, but up to now, there is not one universal tool, so some instruments have better results according to which parts of the value chain they are focussed on.

Probably, some of the innovation tools that we have considered were not created specifically for this intention, but they have proven to be highly effective in innovating. The Business model is a clear example, and, in our virtual box with innovation tools, shows a great versatility since it is capable of acting like a lever, boosting any kind of innovation independently of where the challenge was.

This vision is valid for profit and non-profit organizations whenever and wherever innovation is requested because, in the end, we are always talking about value creation.

This figure 3 shows the whole Innovation Toolbox, with some tools named only as indicative:
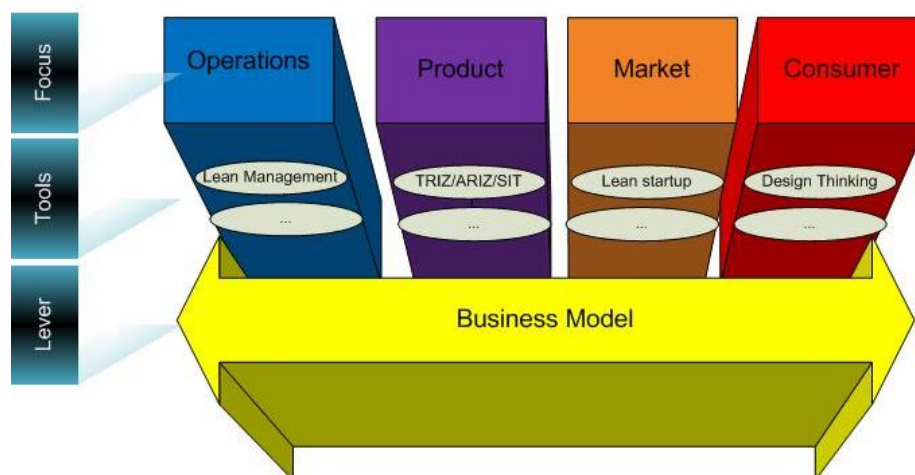
Figure 3: The Innovation Toolbox.

In figure 3 the tools themselves probably don't seem to be the most important part of this tool box. And this is true as far as the most relevant of the innovations created are in the part of the value chain they affect. As mentioned previously, there are not only four relevant types of innovation according to this simplified version of the value chain: operations, product, market and consumer. In each one a broader breakdown of sub-components with specific challenges can be defined.

The tools used to create competitive advantages through innovation are important from the point of view of their ability to create novelties. Some are old, some are new and others probably less known despite being created long ago. But its number is continuously increasing while the need for solutions never ends and technology opens up new fields and opportunities.

The Business model is also represented in a big part of the toolbox (figure 3). This is because of the double function that it has when we accept that innovations must generate value in an economically sustainable

way. The first function is the way to innovate just by the business model itself but, secondly, and this is why it is presented as a lever, by means of an ingredient that must be taken into consideration after the innovative solution is proposed. This allows us to review the whole process from the perspective of value generation. An innovation usually represents a change and an opportunity at the same time for the stakeholders involved because there is no innovation without added value. For this reason, the business model is a relevant part to analyse the new scenario of value generation and its consequent distribution among participants. Therefore, a vision of what the position of the company will be in this situation is important when a novelty is introduced. In fact, if the innovation will be applied in a competitive market, the effect on the business model provides reinforcement to the innovation itself in the long term making it more difficult to be copied.

8. Conclusions

Whereas innovation is a permanent need, business management will rapidly test and adopt all the methodologies that may be endorsed by a success case and, even better, by a highlighted leader in a given sector. The authors' motivation lies in finding which innovation methodologies can be taught to anyone, correctly trained and used repeatedly to generate additional value for companies and society. The Innovation Toolbox is a simple and structured approach to demonstrate highly effective innovation instruments that can be easily learned and applied.

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Self-Directed Learning as a factor to enhance students' resilience at the Hellenic Open University during the covid-19 pandemic

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Abstract

The covid 19 pandemic has created a new educational environment within universities via the dominance of online distance learning in a violent way due to extraordinary circumstances. Many teachers and students who were not sufficiently familiarised with the use of multiple digital tools had to deal with a completely new reality. This reality required them to be promptly trained regarding distance learning tools. The intense pressure that some teachers and students experienced resulted in physical and emotional exhaustion. Most of them had to acquire self-directed learning skills to be able to respond to immediate educational needs as training could not be offered by institutions. In this direction, self-directed learning proved to be a key tool for mental resilience enabling both teachers and students to acquire on their own new digital knowledge and skills within a very short and tight period. In this context, this paper presents the results of a small, yet qualitative pilot study carried out by six (6) of my students at the Open Hellenic University in the form of interviews during the second year of the pandemic. The aim of the study was to investigate the impact of students' immediate adaptation to the new requirements in studying at university as well as the ways they used to respond to and meet the latter. The sample was chosen based on how these students could be supported to be able to respond and meet the new requirements set by the post-graduate course of the university. The interviews were processed using content analysis. The most important findings of the interviews are the following: The students practised to set goals; to promptly look for online valid scientific sources; to ask teachers and fellow students for help feeling more at ease than before; to cooperate with their fellow students more frequently than before by making good use of the social media, creating small groups per module on: Twitter, Viber, Messenger, Facebook. In addition, they attended various webinars, mainly on the use of digital tools. They practised on evaluating their goals and self-assessing their overall learning. Finally, on acquiring skills in self-directed learning, they proved to be more resilient mentally and emotionally than before not only regarding their educational needs but their overall life. Critical reflection on the results of individual resilience achieved through the means of acquiring self-directed learning skills could also positively contribute to the resilience of the universities in the period after the pandemic. In this way, universities could efficiently support institutional and educational reforms resulting from rapid technological changes and raising such questions as follows: who we are as students and educators, what we teach and how we learn, how we collaborate with the rest of the world.

Keywords: pandemic, self-directed learning, resilience, Hellenic Open University' students

1. Introduction

People during their adult life may face different kinds of transitions and crises. The recent pandemic crisis (covid 19), which started in March 2020, has triggered unprecedented situations people had to deal with in all aspects of their life, both personal and professional life, in health and education. At universities across the country and especially at the Hellenic Open University full digitalization of lectures, tutoring, counselling and

thesis presentations became imperative after the university premises had closed down. Many students unfamiliar with the use of multiple digital tools had to face a new reality. This reality demanded their prompt training to use remote learning tools. This intense pressure experienced by many students led some of them to become mentally exhausted and in some cases, there were students who dropped out. Most of the students had to use Self-Directed Learning skills in order to meet the direct educational needs as any other kind of professional or general training was not possible. Towards this direction, Self-Directed Learning resulted in becoming a key tool for mental resilience as students were oriented to acquire new digital knowledge and skill on their own in a very short period of time. In this context, the purpose of this study was to investigate self-directed learning skills, which enabled a group of postgraduate students at the Hellenic Open University (HOU) to overcome learning difficulties during the pandemic, to fulfil their goals and become more mentally resilient.

2. The resilience and the relationship with self-directed learning among graduate students

Many researchers were involved in identifying the skills necessary for the students to deal with learning difficulties due to the pandemic (covid 19). The necessity to develop social and emotional skills contributing to people's positive adaptation and mental well-being to the new conditions due to the pandemic was the subject of an interdisciplinary approach in the field of education.

Resilience, which is referred to as the process of positive adaptation of individuals to new situations regardless the difficulties they deal with, has a key role in this approach. As a term resilience means an individual's ability to withstand difficulties, recover and reconstruct oneself. (Luthar, 2000). Resilience is a dynamic process wherein individuals display positive adaptation despite experiences of significant adversity or trauma. This term does not represent a personality trait or an attribute of the individual (Rutter, 2000). Rather, a two-dimensional construct implies exposure to adversity and the manifestation of positive adjustment outcomes (Luthar & Ciccheti, 2000). Resilience is not a one-dimensional trait a person may have or not. It has been reported that a resilient individual must present positive outcomes in many aspects of his life over a specific period of time. Moreover, resilience involves the coexistence of many skills at different levels, which help an individual to deal with difficult situations. (Fergus & Zimmerman, 2005). The resilience researchers is typically invested in identifying vulnerability and protective factors that might modify the negative effects of adverse life circumstances and, having accomplished this, in identifying mechanisms or processes that might underlie associations found (Luthar, 2000). Each of the pivotal terms subsumed within this broad statement of objectives is explained in turn. Most research on resilience has focused on short-term studies in middle childhood and adolescence (Werner, 1990). Few researchers have carried out research oriented to examine whether resilience is related to the ability of students for self-directed learning. Nevertheless, there are studies that have proved the fact that students who are self-directed in their learning are more mentally resilient to the impact of a crisis. (Werner, 1990; Robinson, 2003). The role of the teacher as adult educator is also very important in this direction. If the teacher is self-directed in their learning it is easy to direct their students to acquire self-directed learning skills (Kalogridi, 2010). Within this context, the aim of this paper is to investigate whether postgraduate students at the OHU, who showed resilience and managed to overcome difficulties and successfully complete their studies had acquired self-directed learning skills. And if so, which self-directed learning skills had they acquired?

3. Self-Directed Learning as a factor to enhance students' resilience

Self-Directed Learning as a concept has been around for a long time. Self-learning ability has been recognised as a trait of human personality since ancient times. Socrates is described as an independent learner who took every opportunity to learn from people around him. Plato considered that the ultimate goal of education for young people should be to develop the ability of self-learning as independent learners in their adult life.

Aristotle emphasized the importance of self-awareness in learning and wisdom development with or without a teacher's guidance (Merriam-Caffarella,1999). In modern times, the first systematic studies in Self-Directed Learning were carried out by Knowels (1975) and Tough (1971). In his book, "Self-Directed Learning", Knowles (1975) representing the theory of Andragogy defined the concept of Self-Directed Learning as an essential component of the maturing process, underlining the ability and necessity for all adult learners to be self-directed, even if they are not well-instructed in this kind of learning. A classic study is the one by Tough (1971), who proved that adult learning occurs to a great extent in an independent way, outside the institutions of ordinary education through the method of learning projects. According to Tough, adults do several projects every year, around 100, estimated at 700 hours annually. Some of these learning projects aimed at acquiring new knowledge or understanding of phenomena. What is interesting is the fact that many times even adults are unaware of this kind of learning as it is not organised within the context of ordinary education. Tough called these projects episodes, which last at least 7 hours and adults retain knowledge and skills for a minimum of two days. These episodes can happen in a variety of settings e.g., in the library, in the kitchen, in a hotel, on a train where the learner can learn with the help of an expert, within a group or on their own (1971). Then the empirical research highlighted many models of Self-Directed Learning developed over time making use of different methods by: Guglielmino - Self-Directed Readiness Scale in 1978; Cavaliere, 1992; Garrison, 1997, Conceptual PRO-Personal Responsibility Orientation model developed 1991 by Brocket and Hiemstra. The development of models through carrying out many studies contributed to the development of a rich dialogue as for defining Self-Directed Learning. Within this context, three major theoretical approaches were formed.

According to Andragogy approach, Knowles described Self-Directed Learning as a form of learning that provides the learner with a structure for organising learning through different stages, such as:

- ✓ Identifying a need or problem that requires a solution,

- ✓ Choosing a way of learning appropriate to solving the problem, and deciding about the learning aim, content, resources, means and methods,

- ✓ Carrying out the learning,

- ✓ Observing and monitoring the process and progress,

- ✓ Evaluating the learning experience and results, and deciding what to do with them (Knowles, 1975).

This model was criticized by representatives of Critical Pedagogy and Transformative Learning, such as Steven Brookfield (1986) and Jack Mezirow (1986). For Brookfield (1993) the fact that the individual plans their learning activities does not necessarily mean that they automatically acquire their autonomy or emancipation, which is the aim of adult education. And this is because in the wider social and cultural environment the individual is formed by the values, needs and beliefs of the society in which they live. They are influenced by dominant institutions such as family and school in ways that limit the possibilities for self-directed learning. In the educational also environment, the curricula based on which we are taught are predetermined, as are the teaching methods and assessment techniques. For Mezirow (1985) self-directed learning should aim at empowering individuals to gain empathy which means they should be creators of their own thinking and emotions, help them understand their experiences and perceive the meaning of their life

From the constructivist approach, Candy (1991) concluded that self-direction refers to four distinct phenomena: "self-direction as a personal attribute (personal autonomy), willingness and capacity to conduct one's own education (self-management), organizing instruction in formal settings (learner-control), and the pursuit of learning opportunities in the natural setting (autodidaxy)" (p. 23). In the same direction, Andruske

(2003) refers to Bourdieu (1977) and his position that the individual functions as a creative, social and political agent in the social environment and develops strategies in order to maximize their opportunities in life. Within this context, Andruske (2003) argues that Self-Directed Learning may be liberating and emancipating for the individual. In the context of the aforementioned reflection for the needs of our study we adopted Knowles's model (1975), however we additionally included the ability for critical thinking on their learning issues as a key element of Self-Directed Learning, as defined by Brookfield (1985) and Andruske (2003), namely: Self-directed learning proves the ability and critical thinking of an individual choosing a way of learning appropriate to solving the problem, and deciding about the learning aim, content, resources, means and methods, observing and monitoring the process and progress, evaluating the learning experience and results.

Additionally, today, a new interest about Self-Directed Learning has arisen due to the explosion of the development of new technologies and the use of digital tools by teachers and mostly students. Students' 24-hour access to educational resources and information, and the opportunity to learn according to their needs of learning. According to a survey conducted in 2011, almost a third of postgraduate students had passed at least one course online, and 65% of higher education institutes considered online education their long-term strategy. With the development of these courses increased autonomy via self-directed learning (Allen & Seaman, 2011). Song & Hill (2007) concluded that self-directed learning is an important aspect of adult education and e-learning with not only many challenges but also achievements. Many studies have emphasized the importance of fostering self-directed skills needed in virtual students to improve educational outcomes and increase academic achievement (Ferrer, 2016). In this context the development of new technologies, (Hiemstra, 2009) along with the new issues arising from the pandemic period have brought Self-Directed Learning to the fore, issues that need research with the aim of a modern, satisfying, fresh approach to building a modern theory.

4. Method

The purpose of this study was to investigate self-directed learning skills, which contributed in helping postgraduate students at the Hellenic Open University (HOU) to overcome difficulties in their studies during the pandemic and also achieve their goals and boost their mental resilience.

The research questions are:

- ✓ What were the difficulties that students had to deal with their studies during the pandemic?
- ✓ Were Self-directed learning skills included in these ways or modes?
- ✓ Do they consider that dealing with difficulties through Self-directed learning boosted their mental resilience?

A qualitative content analysis approach was employed in the present study. The six participants (5 women and 1 man) were MA students at the Hellenic Open University (MA Sciences of Education) in the academic year 2021-2022. They had studied for three academic semesters at a Master's degree level, being willing to participate in the study and having deep experience of the subject matter. The data were collected through semi-structured interviews to allow the participants to express their experience freely. The interviews were analysed based on the method of thematic analysis (Maguire & Delahunt, 2017). Inductive content analysis was employed in which themes and categories were extracted from theoretical content of this article.

5. The Results

Analysis of data revealed four categories of themes and eleven sub-themes concerning the difficulties the pandemic caused to society and education, self-directed learning and skills postgraduates at HOU acquired,

boosting their mental resilience through sdl skills that contributed to successfully respond to their studies. The presentation of the research findings is the following.

5.1. General and educational Difficulties the pandemic caused
5.1.1. General difficulties

The difficulties MA students at HOU had to deal with did not only concern their education but also general issues regarding their family and professional needs, such as available space in their house, the necessity for logistical infrastructure sufficient to meet the needs of all family members, etc.

Student 1W: "*HOU only provided free use of the platform. I had to buy on my expenses the logistical infrastructure necessary for such use.*"

Student 2W: "*Our house was not a private space anymore and was transformed into a workplace for all family members.*".

Student 4W. "*I had to deal with difficulties as a four-member family with a spacious house of three bedrooms ended up making use of the living room or kitchen so that at least each member is in a different room.*

Student 5W. "*It was difficult for me to concentrate on studying as unfortunately I had to study in a common are in the house*".

Student 6M. "*I had a difficulty with time spent to study the educational material as time was very limited due to the increased family and professional responsibilities due to the pandemic.*"

5.1.2. Difficulties in their studies at HOU

Student 2W. "*The main difficulty was the lack of face-to-face communication. The first contact with the digital platform was quite stressful not only for us, but also four our teachers. Any questions regarding the essay writing on the specific theme unit was difficult to be fully addressed via a screen.*"

Student 3W. "*At first, I had to deal with many difficulties as I was not familiarised with remote learning. We were all taken by surprise, and it was important for me to efficiently respond to the new digital tools and different digital platforms.*"

Student 5W. "*I had to deal with quite a few difficulties during the pandemic. It was difficult for me to collect information for my thesis as I could not have access to the General State Archives due to. I also had difficulty in contacting the people I had chosen as samples for my qualitative research,*"

5.2. Self-directed learning skills

Through verbalising the difficulties MA students dealt with they recognise the problems regarding their studies that occurred due to the pandemic, and they develop self-directed learning skills to meet the new needs, such as:

5.2.1. Seeking more help and cooperation from the Teachers - Advisors

Students are found to have sought more cooperation and assistance from HOU Faculty Advisors during this time. The help did not only concern their learning (understanding educational material, writing assignments, etc.), but also psychological support, empowering them to face the unprecedented difficulties of the crisis, caused by the pandemic at all levels. Seeking help and mentoring for learning in adult education is a recognized self-directed learning skill and actually is the first one according to Knwles's model (1975). It is significant that

Student 5W reported that she did this for the first time during her studies. It is also important that there were teachers who cultivated the students' self-direction and self-directed learning skills (eg Student 1W, Student 3W).

Student 1W. "*In the course of my studies, the pandemic was not decisive, I was lucky as a Counselor Professor to meet a teacher who believed in and encouraged students' self-direction, not in the sense of a superficial concession of control and power, but in the sense of encouragement and empowerment of self-directed learning. It was working with her that made me realize the true essence and content of remote learning.*"

Student 3W. "*Yes, of course, the help from the Counselors-Teachers was greater during this time. And we communicated more. My teacher's help was immediate and decisive. She gave me important directions, advice and ideas for references, she pushed me to self-directed learning.*"

Student 4W. "*Talking on the phone or online with my teachers was very important, because they strengthened me both cognitively and mentally. I was also asking for more communication and help. However, teachers were also responsive.*"

Student 5W. "*I asked for more help, communication and empathy from my teachers regarding my psychology and finding the right teaching material. It is something I learnt to do during the pandemic. I had never done that before…*"

5.2.2. More collaboration amongst students

Searching for help, communication, cooperation with the aim of dealing with the difficulties resulted in more addressing fellow students, where it seems to have found very favorable ground. Groups and networks were created on the internet and social media such as viber, face book, etc. and were used a lot.

Student 1W. "*"I had great support from my fellow students at HOU. It is incredible the cooperation that exists in the field of remote learning and which was also confirmed in the use of its methods in conventional education during the years of the pandemic*".

Student 2W. "*Communication and mutual assistance with my fellow students increased during this period. We mainly communicated online through various social media groups, such as Facebook and Viber.*".

Student 4W. "*Collaborating and exchanging concerns and opinions with my fellow students acted as a catalyst and encouragement in my study and completion of my work.*"

Student 5M. "*Cooperation with my fellow students became much stronger. We had daily communication through our team on webex and viber.*"

5.2.3. Making use of the Internet

The pandemic due to the fact the institutions were closed down accelerated the use of the Internet and "imposed" it even on people who were unfamiliar with the use of many platforms, digital tools, etc. In essence, it emerged as the main source of researching for scientific literature, the research in various fields for both studies and personal life. This new situation highlighted self-directed learning as a key strategy for the successful completion of students' studies (Hiemstra, 2009).

Student 1W. "*I gathered information for my essays from books but mostly from the Internet.*"

Student 2W. "*During this period of time the Internet was the only research source for information, references, etc., for my essays.*"

Student 3W. "*Yes, I took fully advantage of technological capabilities and always cross- checked the validity of information given.*"

Student 5W. "*Surfing the net was part of my daily routine. It was the key tool to research references but also information on how to use digital means.*

Student 5M. "*During this period, the internet was the only way to obtain refernces, information, etc.: electronic libraries and websites related to research, supply of books and notes, all from the internet.*"

5.2.4. Self-education

Self-education was another way to self-direct their studies in response to the increased demands due to the pandemic. Self-education mainly concerned their additional training in the use of digital tools and in participating in extra such programs. They had to bear the cost, where necessary.

Student 1W. "*In order to respond to remote learning, I attended several training programs in ICT (web2.0 digital tools, Moocs) on my own initiative and of course I looked for information and videos on the internet.*"

Student 3W. "*I was trained by the Institute of Educational Policy (IEP) regarding digital tools and the design of digital teaching scenarios for the needs of my thesis.*"

Student 5W. "*In order to respond to the new conditions, I had to be trained by a private organization regarding web 2.0 digital tools. And of course, I had to bear the cost.*"

5.3. Critical Thinking and self-directed learning

5.3.1. Critical approach of the information found on the Internet

A key issue of critical reflection is the need to critically approach and manage the volume of information identified by students, who feel that they became more aware of this necessity during the pandemic.

Student 1W. "*It was a challenge to locate the most valid and relevant information on the subject being processed. Here again the role of the Teacher Advisor in guiding the students in the right direction is highlighted. Necessary tools are critical and abstract thinking, but also a sense of proportion for the necessary focus. But I became much more aware during this period of the need to acquire critical thinking with scientific criteria.*"

Student 4W. "*I focused on specific points that were necessary and helpful for the preparation of my essays. And as I mentioned before, I used the information I found in scientific sources and cross-checked it with other sources to see if it was valid.*"

Student 5M. "*The influx of information from the internet was huge and at first, I found it quite difficult to manage all this volume. Then I tried to critically approach the sources, to compare them with basic texts, to check... I became more aware of this need during the period of the pandemic when there was a lack of face-to-face contact.... .*"

5.3.2. Critical thinking on the control they had over their studies

A second issue for critical thinking is the control they had over their studies at a time of unprecedented hardship. However, the answers to the question: "Was there ever a time when you thought about giving up your studies?" were negative, even from those who had initially thought about it.

5.3.2.1. Dropping out

Student 1W. *"I have never thought about dropping out, it does not suit my way of thinking."*

Student 2W. *"At first, I thought about dropping out, as I was really stressed with assignments, studying and work, so I considered the easy way out was to drop out."*

Student 5W. *"No, I was really focused on my goal to complete my studies, regardless the difficulties I had to deal with."*

Student 5M. *"At first yes, but then my teacher's support and the collaboration with my fellow students strengthened me and I thought it was a matter of controlling difficulties."*

5.3.2.2. Differentiation of goals

Another question concerned the differentiation of their initial goals regarding their studies. That is, if they lowered their goals or, on the contrary, set higher ones. Their answers show that despite the initial thoughts, due to the difficulties along the way, they became stronger and set higher goals.

Student 1W. *"No, the goals remained high, the means varied with flexibility and adherence to priorities."*

Student 1W. *"I would say that due to difficulties goals and requirements for ingenuity, flexibility, resilience and experimentation towards new methods and tools increased."*

Student 3W. *"The fact that I was able to successfully combine my postgraduate studies with attending other remote learning programmes, which began to be implemented during the pandemic, made me 'raise the bar higher'."*

Student 5W. *"Yes, I think that after I succeeded in achieving my goals during the pandemic with so many difficulties, now I am ready to set even higher goals."*

5.3.2.3. Controlling learning process

When asked whether during the pandemic they felt that they lost control of their learning process or part of it they answered negatively. Difficulties empowered them with a greater control over their learning.

Student 2W. *"I gained more control during this period, as the whole process required more preparation and planning."*

Student 3W. *"I consider that the difficulties of the pandemic made me gain absolute control over my learning and greatly enrich my knowledge."*

Student 5W. *"Although I had a lot of difficulty, in the end through my self-reflection I think I gained more control over my learning, because due to the difficulties I learnt how to make a proper assessment and evaluation of my learning process."*

5.4.   Self-Directed Learning and Resilience

It is noticed that students by developing self-directed learning skill now feel more resilient to deal with ongoing educational difficulties or other possible difficulties in their personal and professional lives. Dealing with the difficulties caused by the pandemic strengthened them and made them more resilient to succeed in their studies and to be ready to deal with further difficulties, since the pandemic has not disappeared.

Student 2W. *"At first, I felt anxiety, insecurity, uncertainty. But along the way I acquired a positive and optimistic attitude and considered all this change as an opportunity to develop at a professional and personal level."*

Student 3W. *"Yes, I think that the difficulties I went through during my studies have made me more resilient."*

Student 2W. *"I refreshed my knowledge, cultivated my skills, became more resilient to adversity and increased my digital skills by creating multi-format material."*

Student 4W. "I feel more resilient to face difficulties now both in my studies and at work. The pandemic is not over yet. I want to make use of the self-learning skills I acquired during this period and in the future."

Student 6W. *"I feel that the crisis we experienced worked positively for me, because it was an important challenge to strengthen my knowledge and skills."*

Student 1W. "Every obstacle in life brings out our hidden potential the hard way. I would not like to give a positively simplistic answer to this question. I would prefer self-confidence and empowerment of both teachers and students to be the result of targeted policies, actions, targeted educational policy makers and not circumstances in which the ones that are already privileged "survive" or emerge (personally I disposed of the necessary digital skills on my own initiative, and I still have the means - I doubt how much longer in the era of impoverishment- for appropriate technical equipment."

6. Conclusions

This paper presented a qualitative, exploratory study with a small sample of graduate students at HOU, who successfully completed their studies, at the end of the 2nd year of the 2020-2021 pandemic. The purpose of this study was to investigate self-directed learning skills, which helped postgraduate students of the Hellenic Open University (HOU) to deal with the difficulties in their studies during the pandemic, achieving their goals and increasing their mental resilience. Its results are not representative but can be used for further research on self-directed learning and its contribution to the successful completion of students' studies, as a factor that strengthens their mental resilience in dealing with difficulties in times of crisis.

Data of analysis resulting from semi-structure interviews revealed four categories of themes:

- *Difficulties*

At the beginning of the pandemic, students dealt with difficulties not only in their studies, but also in their personal and professional lives. They did not have complete technological equipment to meet the needs of the whole family for online teaching. Additional needs were covered at their own expense. Most of them did not have enough space in their residence for all family members to work independently and quietly. They were thus forced to work in communal areas where their attention was easily distracted. They also encountered difficulties in their studies mainly related to the use of digital tools requiring more familiarity with the use of different platforms, difficulties in searching for resources, time management, absence of face-to-face

communication, but also difficulties in implementing research projects, as many institutions did not allow access to the public due to covid 19.

- *Self-directed learning skills*

The MA students successfully coped with the difficulties due to the pandemic and successfully completed their studies in September 2021. Our main research question was whether they adopted Self-directed learning skills, which helped them to meet the demands of the new status. The interviews revealed that this was the case. For some (4) it was a completely conscious process because the Teacher Counselor trained them for it and for the other two it is probably true that people are born with these skills. The skills recognized, according to the literature, were:

- ✓ **The cooperation and help** they sought from the HOU Teachers-Advisors, which was more intensive than in the past, as they reported. And this was done after realizing the problems caused by the pandemic. The help, as mentioned, did not only concern their learning (understanding educational material, writing assignments, etc.), but also psychological support, empowering them to face the unprecedented difficulties of the crisis due to the pandemic at all levels. Especially the meeting with Teachers who nurtured students with self-directed learning skills proved to be very fruitful (Kalogridi, 2010).

- ✓ **The collaboration with their fellow students** that really expanded and took on new dimensions. While implementing it, they maximized the use of social networking such as groups on Webex, Viber, Facebook, etc. It is important to mention that for some this cooperation continues even today in other matters.

- ✓ **The use of the internet**, which became widespread due to the closing down of University Institutions and not only that. Students who were not very familiar with its use were "forced" by self-directing their learning to quickly adapt to the new requirements.

- ✓ **Self-education** mainly concerned their additional training in the use of digital tools and attendance of extra such programmes. Self-education is a dimension of self-directed learning, after the students themselves diagnosed their needs and chose the appropriate programmes to meet them. The had to bear the cost as they had to buy on their expenses the technological infrastructure.

- **Critical Thinking and self-directed learning**

- ✓ *Critical thinking*. Self-directed learning demonstrates the individual's ability and critical thinking to plan their own learning activities, perform them, select appropriate techniques, set realistic learning goals, and organize assessment procedures. Organizing their learning in the new conditions as well as the skills they developed show that the students thought critically to take the specific actions and make choices regarding the successful outcome of their studies and their learning in general.

- ✓ *Critical approach of information found on the Internet*

  As it can be seen from the students' answers, they realized the need for critical approach and handling of the huge amount of information that the internet offers on every topic. They even stated that during this period, when the internet was the only source of literature for the needs of their work, etc., they became more aware of this necessity.

- ✓ *Critical thinking on the control they had over their studies*

  Contrary to other students who had a lot of difficulty in their studies due to the pandemic or even dropped out, our sample students stated that despite the initial difficulties they did not think of dropping out. When asked whether during the pandemic they felt that they lost control of their

learning process or part of it they answered negatively. The difficulties enabled them to gain more control over their learning, which will be very useful for them in the future. In addition, they diversified their initial goals, setting even higher ones.

- **Self-Directed Learning and Resilience**

  It is noticed that students by developing self-directed learning skills now feel more resilient to deal with ongoing educational difficulties or other possible difficulties in their personal and professional lives. Dealing with the difficulties caused by the pandemic strengthened them and made them more resilient to succeed in their studies and to be ready to deal with further difficulties, since the pandemic has not disappeared.

At the end self-directed learning can play an important role in times of crisis like the pandemic (covid 19). Acquiring Self-Directed Learning skills during the pandemic proved to be a key factor of mental resilience to cope with all the difficulties and successfully complete their studies as MA students at HOU. It is a field that should be studied by universities aiming at being examined within the new conditions resulting not only due to the pandemic but also the rapid expansion of digital learning. The response of students to these conditions presupposes that, in addition to sdl skills, universities must develop programmes for the cultivation of critical thinking, with the aim that learning has a personal meaning for each individual, is a conscious action that empowers individuals, it puts them in readiness, as well as placing itself within the historical-social-political context in which it occurs. Especially today, when everyone recognizes that in the post-covid era universities will no longer be the same as in the past.

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Digital courses in 21st century skills

Agile methods as an educational tool: The Agile2Learn project

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Abstract

All over the world, the development of transversal skills and competences is promoted as a key factor for competitiveness, as they are relevant to all professions and jobs. EU has highlighted the importance of advancing an EU training culture by fostering the right mindset and entrepreneurship-related skills. In addition, the rapid changes in the world scene, the pressure in education to harmonize with changes, the teachers' need to adapt to new and emerging techniques, tools, and teaching methods, the advent of covid-19, and the need for distance learning, the need to support the dynamic needs of today's students have led to a growing interest in applying Agile methodology in the classroom. To this end, an innovative project was designed and implemented in the framework of an Erasmus collaboration. The aim of the project is professional development through appropriate training of the personnel who work in secondary education. The Agile2Learn project is introducing Agile Project Based Learning to secondary education schools as a new enhanced educational approach to promote the development of key transversal competences in order to incorporate the benefits of modern business processes such as agile techniques and principles into training. Those principles can be very well used by schools and teachers in order to educate more efficiently and make the classes more attractive for students and consequently equip the students with extra skills to be more successful in the labor market. The Agile2Learn project developed a curriculum – a codified knowledge to be learned, a set of planned activities influencing teaching and training, and related to individual trainees to define personalized learning in order to guide teachers to be more efficient in their educational projects. The curriculum included the development of a set of competences that were detected as desired ones according to the results of a survey contacted with the academic staff of primary and secondary education of the project partners and after a systematic literature review in order to select the most crucial ones that meet the purpose of the project. A training course and training contents were also designed and developed to reinforce skills and competences needed and to upskill teachers. At the same time, this training enabled school staff to properly manage national and transnational educational projects. The implementation of the Agile principles helped teachers to increase the effectiveness and the attractivity of their lessons by developing students' competences as collaboration, communication, teamwork, creativity, critical thinking, social skills,

entrepreneurial thinking, etc. They trained the students to work autonomously in teams by leading them to find the solution on their own, distributing the team roles and leading the project themselves, to support each other to get the best possible result and plan the work, to better communicate in the team, to think critically by leaving self-evaluating their own performance, to be more flexible and have better control of own work in order to become independent, engaged future citizens of 21st century.

Keywords: agile methodologies, agile education, transversal competences, digital competences, secondary education curriculum.

1. Introduction

Nowadays, the rapid development of technology and globalization forces our societies to deal with continuous and in many cases unpredictable challenges in social, economic, and environmental domains. These challenges create both opportunities for improvements but also and obstacles that people need to deal with (OECD,2018). As this trend is most likely to continue in the forthcoming years, people and especially youngsters need to be equipped with a set of competences that will allow them to effectively operate and evolve in such an environment. Such an educational approach beyond the traditional transfer of knowledge is required which in addition will cultivate competences to students that will be useful for them in their later life either professional, personal, or as citizens. Among the alternative approaches in modern education, the use of agile methods in education becomes increasingly popular as is an approach offering a new educational method that beyond of the transfer of knowledge allows the development of competences such as communication, team working, critical thinking, problem-solving, etc. EduScrum (Delhij et al., 2015), Scrum@School (Reehorst et al., 2018) and Agile Educator Guide (Scrum Alliance, 2021) are some of the educational methodologies trying to apply agile in the modern education system. However, this new approach requires a different approach by teachers in the learning process and a need for training/educating them in order to be able to successfully apply agile methodologies and get the desired result from this attempt. This research considers the requirements for competences that are set by various educational frameworks issued by various organizations, the principles and methodologies of agile education propose a curriculum for educating teachers in order to obtain the necessary knowledge and competences to effectively apply agile methodologies in classrooms. The structure of this article is as follows. In section 2 literature review in the field of modern competences required by modern people and various approaches of the agile methodology in education are presented. In section 3 the methodology followed in this research is presented. The design and curriculum structure is presented in detail in section 4. Finally, the conclusion and future work are presented in section 5.

2. Literature review

2.1 Competences requirement by modern man

Globalization, structural changes in the labor market, and the rapid development of new technologies require young people to have a wide set of skills and competences to find satisfactory well-payed jobs, and be independent, and engaged citizens. The development of key competences either domain or non-domain specific is at the heart of educational design all over the world (Caena & Punie, 2019). Domain-specific skills are those related to a specific field of knowledge. "General (non-domain specific) skills and competences" refer to those skills and competences that have been and continue to be the subject of the most extensive and intensive public debate nowadays. It is these skills that seem to be emerging as an important aspect of modern economies and job markets, as they are relevant to all professions and jobs. Especially nowadays, where the rapid development of technology, the availability of information, and modern application with immediate interaction affect every part of our life and as a consequence the way we think, act, behave, believe and

practice is extremely affected (Lintzeris & Karalis, 2020). Therefore, it is important to equip people with a set of competences that can effectively, efficiently, and constructively deal with all these. Under this prism, European Union (EU) has proposed a set of frameworks describing the competences that people should have in forthcoming years. European Reference Framework describes the key competences for Lifelong Learning (European Commission, Directorate-General for Education, Youth, Sport and Culture, 2019) in European Schools. All individuals need the described competences within this framework for personal fulfillment and development, employability, social inclusion, and active citizenship. These can be developed through formal, non-formal, and informal learning.

Table 1 Competences for lifelog learning

Competences	Description
Literacy	Literacy is the ability to identify, understand, express, create, and interpret concepts, feelings, facts and opinions in both oral and written forms, using visual, sound/audio and digital materials across disciplines and contexts. It implies the ability to communicate and connect effectively with others, in an appropriate and creative way.
Multilingual	Defines the ability to use different languages appropriately and effectively for communication.
Mathematical	Mathematical competence is the ability to develop and apply mathematical thinking and insight in order to solve a range of problems in everyday situations.
Science	Competence in science refers to the ability and willingness to explain the natural world by making use of the body of knowledge and methodology employed, including observation and experimentation, in order to identify questions and draw evidence-based conclusions.
Technology, Engineering	Competences in technology and engineering are applications of that knowledge and methodology in response to perceived human wants or needs.
Digital	Digital competence involves the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society. It includes information and data literacy, communication and collaboration, media literacy, digital content creation (including programming), safety (including digital well-being and competences related to cybersecurity), intellectual property related questions, problem solving and critical thinking.
Personal, Social and learning to learn	Personal, social and learning to learn competence is the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one's own learning and career. It includes the ability to cope with uncertainty and complexity, learn to learn, support one's physical and emotional well-being, maintain physical and mental health, and to be able to lead a health-conscious, future-oriented life, empathize and manage conflict in an inclusive and supportive context.
Citizenship	Citizenship competence is the ability to act as responsible citizens and to fully participate in civic and social life, based on the understanding of social, economic, legal and political concepts and structures, as well as global developments and sustainability.

Entrepreneurship	Entrepreneurship competence refers to the capacity to act upon opportunities and ideas, and to transform them into values for others. It is founded upon creativity, critical thinking and problem solving, taking initiative and perseverance and the ability to work collaboratively in order to plan and manage projects that are of cultural, social, or financial value
Cultural awareness and expression	Competence in cultural awareness and expression involves having an understanding of and respect for how ideas and meaning are creatively expressed and communicated in different cultures and through a range of arts and other cultural forms. It involves being engaged in understanding, developing and expressing one's own ideas and sense of place or role in society in a variety of ways and contexts

Another framework is LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence (Sala et. al., 2020). It identifies a set of competences people need to develop that allow them to successfully deal with challenges taking place in their professional and/or personal life and in society in general, using either formal, non-formal and informal education. This framework can be used as a basis for the development of curricula and learning activities fostering personal, and social development, and learning to learn. In table 2 the identified competences in this framework are presented.

Table 2 competencies Identified in LifeComp framework

Competences categories	Competences	Description
Personal	Self-regulation	Awareness and management of emotions, thoughts and behaviour
	Flexibility	Ability to manage transitions and uncertainty, and to face challenges
	Wellbeing	Pursuit of life satisfaction, care of physical, mental and social health; and adoption of a sustainable lifestyle
Social	Empathy	The understanding of another person's emotions, experiences and values, and the provision of appropriate responses
	Communication	Use of relevant communication strategies, domain-specific codes and tools, depending on the context and content
	Collaboration	Engagement in group activity and teamwork acknowledging and respecting others
Learning to Learn	Growth mindset	Belief in one's and others' potential to continuously learn and progress
	Critical thinking	Assessment of information and arguments to support reasoned conclusions and develop innovative solutions
	Managing learning	The planning, organising, monitoring and reviewing of one's own learning

Traditional education systems are based on pedagogical models and practices of the last century and are focused on transferring mainly academic and/or technical knowledge under the scheme "one fits for all" and they are not able to fulfill the aims of modern age as they presented in previous sections. As such, new

pedagogical models and practices supporting dynamic learning with flexible curriculums, students that learn how to learn, be able to solve problems, find solutions and value common prosperity, sustainability and well-being are required (OECD,2018).

2.2 Agile methodologies in education

The agile approach is about doing things in a collaborative, self-directed, incremental and iterative way. The implementation of the agile approach in education gives students the responsibility to organize their own tasks division, planning and approach (Reehorst et al., 2019). In an agile environment, student teams set their own goals, reflect upon them, encourage innovation and experimentation, interact and adjust work plans according to team dynamics and progress (Krehbiel at al., 2017). Agile in a classroom can be applied in several ways such as through project-based learning, problem-based learning, inquiry-based learning, or as an alternative way to fulfill curriculum requirements (Scrum Alliance, 2021).

During the last years, a set of agile educational approaches have been introduced preserving specific principles and values of agility adjusted to a classroom environment. Specifically:

According to **Agile School Manifesto** by Peha (2011), an agile education should embarrass the following values:

- Student interactions over lectures and textbooks
- Meaningful learning over the measurement of learning
- Stakeholder collaboration over complex negotiation
- Responding to change over following a plan

The **Agile Manifesto for Higher Education** by Kamat (2012), an agile education should embarrass the following values:

- Teachers and students over administration and infrastructure
- Competence and collaboration over compliance and competition
- Employability and marketability over syllabus and marks, and
- Attitude and learning skills over aptitude and degree

The **Agile Pedagogy Manifesto** by Royle and Nikolic (2016), an agile education should embarrass the following values:

- Practice preferred to theory
- Learner choice and agency preferred to learners being limited and controlled
- Learning and applying skills preferred to learning facts
- Collaboration preferred to competition
- Customized learning preferred to standardized one size fits all, and
- Co-constructed learning preferred to teacher-led learning

The **Agile Manifesto for Teaching and Learning** by Krehbiel et al. (2017), an agile education should embarrass the following values:

- Adaptability over prescriptive teaching methods.
- Collaboration over individual accomplishment.
- Achievement of learning outcomes over student testing and assessment.
- Student-driven inquiry over classroom lecturing.

- Demonstration and application over accumulation of information.
- Continuous improvement over the maintenance of current practices.

The **Manifesto for Agile education** by Scrum@School (Reehorst et al., 2018), an agile education should embarrass the following values:

- Responsibility for students above control by teachers.
- Kaizen mindset (continuous improvement) above meeting standards.
- Teamwork above individual excellence.
- Feedback above grades.
- Respond to change above following a plan.

From the above, it can easily be concluded that agile education is a totally new educational approach and as such, it is needed to be applied by informed and trained teachers to fulfill its aims and show its dynamic. Therefore, as current teachers are in their vast majority unfamiliar with agile methodology, it is required to be trained in it to be able to apply it effectively and efficiently. Furthermore, the appliance of agile methodologies requires not only the theoretical knowledge of agile methodologies but the existence of a wider set of skills and competences by teachers such as communication, teamworking, empathy e.t.c.

3. Research methodology

A curriculum aiming to train teachers in the appliance of agile methodologies in education in a classroom environment should be based on solid foundations. According to the requirements set, such curriculum should be in line with digital transformation and the use of technology in our everyday life (digital competences), help teachers to develop or update critical personal and social skills (transversal competences) and obtain necessary technical knowledge about agile methodology artifacts, ceremonies and functions with respect to classroom environment (agile competences).

Digital Competence framework for Educators – DigiCompEdu (Redecker and Punie, 2017), Digital Competence Framework for Citizens - DigiComp2.2 (Vuorikari, et al., 2022) and Pedagogical Guide of Digital Competency Framework (Ministère de l'Éducation et de l'Enseignement supérieur, 2020) were used to identify the necessary digital competences. The last was used also to identify some of the transversal competences as well. Sources for identifying more transversal competences were the EU conference entitled "Supporting Key Competence Development: Learning approaches and environments in school education" (European Commission European and Directorate-General for Education, et al., 2020), the Key Competences for Lifelong Learning in the European Schools framework (European Commission; Directorate-General for Education, Youth, Sport and Culture, 2019) and LifeComp: The European Framework for Personal, Social and Learning to Learn Key Competence (Sala et al., 2020). They were presented in details at section 2.1. Finally, for identifying agile competences, mainly Scrum (Sutherland, 2014) and Kanban(Anderson, 2010) agile methodologies were used along with various agile educational frameworks such as Manifesto for Agile education (Scrum@school, 2018), EduScrum Guide (Delhij, 2015) and Scrum@School Guide (Reehorst et al., 2019). All the above propositions lead to the formation of Agile2Learn curicculum for teachers as can be seen in Figure 1.
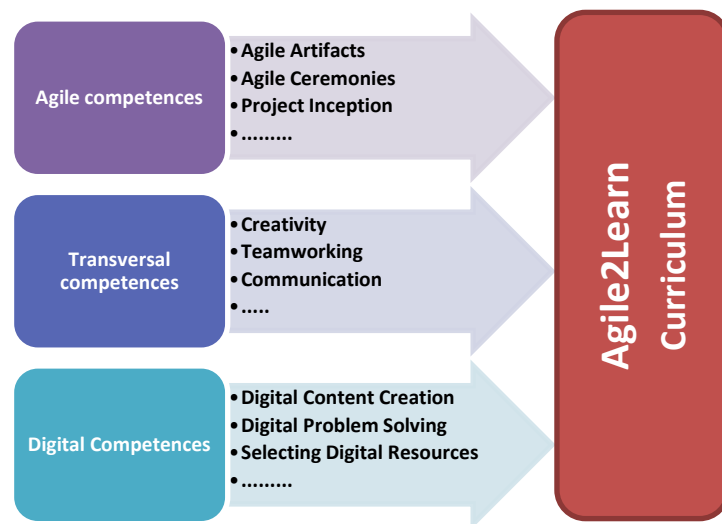
Figure 1 Agile2Learn curriculum components

Initially, 25 competences from all 3 components were identified. The initial list was given to 12 experts from 4 countries namely Greece, Italy, Germany and Czech Republic for refinement. Experts were from the domains of secondary, adult, and VET education. The result was a final list of 21 competences. Table 3 presents the final list of competences per category.

4. Agile2Learn Curriculum

4.1 Curriculum Competences

The proposed curriculum incorporates 3 types of competences, agile, transversal and digital. Transversal competences, according to UNESCO UNEVOC Glossary (UNESCO International Bureau of Education, 2013), are those typically considered as not specifically related to a particular job, task, academic discipline or area of knowledge but as skills that can be used in a wide variety of situations and work settings. These skills are increasingly in high demand for learners to successfully adapt to changes and to lead meaningful and productive lives.

Digital competences identified in this curriculum aim in supporting an educator/teacher to identify, select, use and evaluate digital tools that can assist them in the educational process in order to improve learning process and in addition help them in their individual development.

Table 3 Agile2Learn competences

Category	Skill	Description
Agile competences	Agile Methods Fundamentals	Scrum, Kanban, Lean Management, XP
	Entrepreneurial Thinking	The ability to identify market opportunities and find the most suitable ways to capitalize on them using appropriate knowledge and working either individually or collaboratively as a team member having a sense of agency, forward-looking and courage.
	Project Inception (Planning)	Refers to addressing how to complete a project in a certain timeframe, usually with defined stages and designated resources. Usual tasks are defining project roles,

		facilitating communication, enabling effective monitoring, setting measurable objectives, defining deliverables, performing scheduling, planning tasks etc.
	Self-Managed Teams	Refers to the formation of a group of people who use their diverse skills, knowledge and experience to achieve a common goal by taking full responsibility for delivering a service or product through peer collaboration without a manager's guidance.
	Agile Artifacts	Refers to information that stakeholders and the scrum team use to describe a product that's being developed. They define the work that must be done e.g.: Product backlog, scrum backlog, product increment.
	Agile Ceremonies	Agile ceremonies are periodic meetings held to ensure that projects are on time and meeting quality goals. E.g. in SCRUM these are: Sprint, Sprint Planning, Daily Scrum, Sprint Review, Sprint Retrospective.
Transversal competences	Communication	To understand the codes, rules, techniques and barriers of a communication in different environments and situations
	Creativity	To think about a task or a problem in a new or different way and to find connections between different ideas and use those connections to solve problems
	Teamworking	The collaborative effort of a group to achieve a common goal or to complete a task in the most effective and efficient way taking into consideration individual strengths and diverse perspectives)
	Social Skills	A social skill is any competence facilitating interaction and communication with others where social rules and relations are created, communicated, and changed in verbal and nonverbal ways. Examples of social skills are effective communication, conflict resolution, active listening, empathy, etc.
	Handling Ambiguity	The ability to deal with ambiguous situations in a sensible and systematic way. It is directly related to risk management. Take decisions when the information available is partial or ambiguous, or when there is a risk of unintended outcome
	Critical Thinking	Actively and skillfully conceptualizing, applying, analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication)
	Problem Solving and Decision Making	Problem-solving skills help you determine the source of a problem and find an effective solution. Some key problem-solving skills include: Active listening, Analysis, Creativity, Communication, Dependability, Decision making, Team-building. Decision-making is the ability to think objectively and relate concepts in order to choose between alternatives
	Time Management	The ability to use the time productively and efficiently by prioritizing and scheduling what needs to be done to achieve

Digital competences	Digital Collaboration At Professional And Learning Level	To use digital technologies to collaborate.
	Selecting Digital Resources	To identify, assess and select digital resources for teaching and learning. To consider the specific learning objective, context, pedagogical approach, and learner group, when selecting digital resources and planning their use.
	Creating and Modifying Digital Resources	To modify and build on existing openly-licensed resources and other resources where this is permitted. To create or co-create new digital educational resources. To consider the specific learning objective, context, pedagogical approach, and learner group, when designing digital resources and planning their use.
	Managing, Protecting and Sharing Digital Resources	To organize digital content and make it available to learners, parents and other educators. To effectively protect sensitive digital content. To respect and correctly apply privacy and copyright rules. To understand the use and creation of open licenses and open educational resources, including their proper attribution.
	Actively Engaging Learners	To use digital technologies to foster learners' active and creative engagement with a subject matter. To use digital technologies within pedagogic strategies that foster learners' transversal skills, deep thinking and creative expression.
	Digital Content Creation	To incorporate learning activities, assignments and assessments which require learners to express themselves through digital means, and to modify and create digital content in different formats. To teach learners how to copyright and licenses apply to digital content, how to reference sources and attribute licenses.
	Digital Problem Solving	To incorporate learning activities, assignments and assessments which require learners to identify and solve technical problems, or to transfer technological knowledge creatively to new situations.

4.2 Curriculum Delivery Pathways

There will be two learning pathways to be delivered. More specifically:

- Agile as a pedagogical tool (use specific strategies adopted from software development to achieve greater learning and collaboration, satisfy the needs of students through early and continuous delivery of meaningful learning, welcome changing requirements, even late in a learning cycle, and harness change for the benefit of students, build projects around motivated individuals, continuous attention to technical excellence and good design enhances adaptability, etc.)

- Agile as a school development tool (easily plan, collaborate and reflect on the design and teaching of curriculum units on an on-going basis, plan at the department level, with changes reflected on the whole-school curriculum map, make links across subjects and units easily in order to build trans- and inter-disciplinary projects and learning experiences for students, completely personalize the structure of units to the requirements of the school or the curriculum, e.t.c.).

4.3 Curriculum Delivery Guidelines

4.3.1 Curriculum delivery models

The proposed curriculum is structured around two different delivery models. These delivery models are: blended learning, and a project-based learning stage.

- The blended learning approach combines online educational materials and opportunities for interaction online with traditional place-based classroom methods. It requires the physical presence of both teacher and student, with some elements of student control over time, place, path, or place. As such blended learning approach will be used for the Agile2Learn Training Course, in order primary and secondary school teachers to acquire the basic competencies and combine them during e-learning and face-to-face lectures.
- In parallel, with the other two delivery modes, Agile2Learn social partners in each country will identify a pool of stakeholders willing to be trained during their project-based learning stage as well as to develop their skills to apply agile PBL in the classroom in order to properly manage any national and transnational educational project.

4.3.2 Agile2Learn Curriculum Structure

Agile2Learn curriculum structure has two basic stages. These stages are:

- Training courses delivery phase and
- Project-based learning and agile learning phase

Overall, these phases could be overlapping, however in the context of agile2Learn project the sequence is demonstrated in Figure 2.

Delivery Guideline 1 — Blended Learning (f2f + online learning + online workshop) — 8 weeks / 2 months

Delivery Guideline 2 — Training course — Project-Based Learning + Agile Learning — 16weeks / 4 months
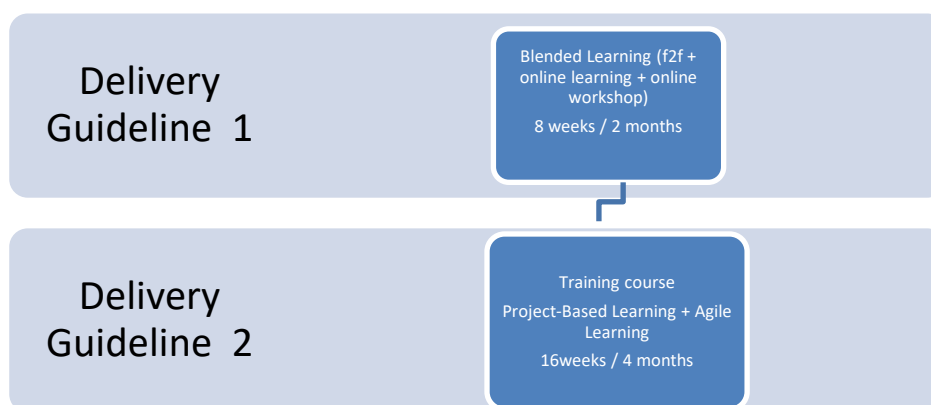
Figure 2 Agile2Learn training scheme

Guideline 1 - The delivery of the training course piloting is proposed to last 8 weeks.

Guideline 2 - Project based learning and agile Learning is propose to last 16 weeks with approximately 5h of work in the placement / week

4.3.3 Guideline 1 – Delivery of training course (Blended learning)

The blended course is proposed to last 8 weeks, around 40 hours, and includes face-to-face workshops/tutoring meetings (12 hours), and online learning materials and tools for interaction including self-study. It will be delivered in the first 2 months of the piloting phase. The certificate of course attendance will

be issued only upon the completion of the full training including the project work. The Blended learning consists of three phases:

- Phase1: Introductory
- Phase 2: Specific to Agile learning
- Phase 3: Specialized Knowledge

The following are the competences – skills, 21 in number, will be delivered in three phases through Blended Learning. The first phase is aiming in provide introductory knowledge about agile methodologies to learners, the second in introducing them to more specific concepts in applying agile methodologies and the third to provide specialized learning in specific domains.

Table 4 Blended learning phases with modules

Phase 1 (Introductory)	Phase 2 (Specific to agile learning)	Phase 3 (Specialized knowledge)
(DIGITAL) Creating and modifying digital resources (DIGITAL) Selecting digital resources	(DIGITAL) Digital collaboration at professional and learning level (DIGITAL) Actively engaging learners	(DIGITAL) Digital problem solving (DIGITAL) Digital content creation (DIGITAL) Managing protecting and sharing digital resources
AGILE (Agile Fundamentals)	(AGILE) Project Inception (Planning) (AGILE) Self-Managed Teams (AGILE) Agile Artifacts (AGILE) Agile Ceremonies	
(TRANSVERSAL) Communication (TRANSVERSAL) Teamworking (TRANSVERSAL) Problem-solving and decision making (TRANSVERSAL) Creativity (TRANSVERSAL) Critical Thinking	(TRANSVERSAL) Time management	(TRANSVERSAL) Entrepreneurial Thinking (TRANSVERSAL) Social Skills (TRANSVERSAL) Handling Ambiguity

There will be two learning pathways to be delivered

- **Agile as a pedagogical tool** (use specific strategies adopted from software development to achieve greater learning and collaboration, satisfy the needs of students through early and continuous delivery of meaningful learning, welcome changing requirements, even late in a learning cycle, and harness change for the benefit of students, build projects around motivated individuals, continuous attention to technical excellence and good design enhances adaptability, etc.)
- **Agile as a school development tool** (easily plan, collaborate and reflect on the design and teaching of curriculum units on an on-going basis, plan at the department level, with changes reflected on the whole-school curriculum map, make links across subjects and units easily in order to build trans- and

inter-disciplinary projects and learning experiences for students, completely personalize the structure of units to the requirements of the school or the curriculum, e.t.c.).

The specific modules per pathway will be developed at a later phase as soon as the educational design has progressed considerably.

4.3.4   Guideline 2 - Project-based Learning

Project-Based Learning and Agile Learning will last 16 weeks, with approximately 5,5h of work in the placement per week (a total of 85h) and a final assessment. Additionally, face-to-face training activities for trainers, employers and learners will be organized.

More details in this delivery mode will be provided at a later stage as the education design has progressed considerably.

5.   Conclusion

Nowadays, teachers need to adapt to new and emerging techniques, tools, and teaching methods. As this is not an easy process, various approaches have been proposed with the use of agile methodologies being one of the most promising approaches. This research is about designing an education curriculum aiming to upskill competences of secondary school teachers in order to be able to effectively and efficiently apply the agile methodology in a classroom environment. As such, an investigation of various agile education frameworks has been proposed were done, in order to identify the key elements in them that an agile educational curriculum should have. Furthermore, to identify the key competences a modern curriculum should embrace, research was done on several educational guides issued by international organizations such as OECG and European Commission and in the relevant literature. The result is the development of curricula based on the development of three types of competences namely agile, transversal and digital. In total 21 competences were proposed. It also described how these curricula should be delivered in order to be maximized their efficiency.

As this is an ongoing work there are a lot of details that need to be defined. Furthermore, the proposed methodology will be tested and evaluated through its appliance to a set of secondary school teachers and according to feedback that will be received.

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Digital Skills in Education: Evaluating a media-didactic online Teacher Training including a Virtual Learning Community

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Abstract

This paper is devoted to the results and outcomes of the evaluation of an online media-didactic teacher training. The training consists of self-paced asynchronous modules for independent learning about how to use digital media for teaching and an online community for exchange and peer review among German teachers. The aim of this training is to further develop teachers' digital skills, which are nowadays required for integrating digital media not only into the preparation of teaching material, but also into the lesson itself and into daily teaching methods. The training has been developed based on specific media-didactic quality indicators, which have been identified and analysed through a literature analysis. The overall training's effectiveness seems to depend on factors like the practical relevance of the training content for the participants, their prior experience with online media-didactic trainings, the overall acceptance of online learning, the user experience and communication and feedback of participants. During the pilot testing of the final media-didactic online teacher training, the effectiveness of the training has been evaluated by interviewing some of the participants after they have completed the training. The results of this evaluation, with focus on the usage, the training assessment, and the effects of the online training, will be further presented and discussed in this paper. Overall, the research question "What influences the acquisition of digital competencies that teachers strive for during online media didactic teacher training?" is answered by conducting a three-level training evaluation that contributes to the assessment of knowledge acquisition and ensures the implementation of this knowledge in daily teaching scenarios, resulting in comprehensive learning and training success.

Keywords: media-didactic training, digital media, digital skills, teacher training evaluation, online learning, knowledge acquisition, virtual learning community

1. Introduction

The conditions of teaching in Germany have significantly changed in the last three years during COVID-19 times, especially with regards to the use of digital learning environments, online tools, and digital media, not only for purposes like lesson preparation, but also as the main way of teaching and learning. Even though the use of digital media and generally the digitalization in society is part of our modern lifestyle, the pandemic created challenging circumstances in education. The teachers had to acquire digital competencies from one day to another and had to implement new digital tools and use digital media, to structure, conduct and manage daily online lessons.

Teacher's competencies in using digital tools in class are a crucial factor for successful digital student learning. At the same time, teachers do not feel sufficiently qualified to use digital media in their lessons (Rohleder, 2019). According to the research findings of the meta-analysis by Hillmayr, Ziernwald, Reinhold, Hofer and Reiss (2022), the only way to overcome this situation is to provide appropriate teacher trainings on how to apply digital media in the classroom and on how to combine digital media with other instruction methods.

Despite the increasing importance of digital education, there is indeed still a lack of systematic concepts to promote the media-pedagogical competencies of teachers within the framework of teacher training (Waffner, 2020). Implementing digital media in the classroom requires the fundamental technological and didactical understanding of the use of the various digital media. Teachers need time to experiment and practice with digital media, until they know how it can be applied properly and effectively in the classroom (Mishra & Koehler, 2006).

The training "UndiMe - Teaching with Digital Media in Saxony" [1] aims to strengthen teachers' media-didactic skills through an online teacher training so that they can later implement digital media in their lessons (digiteach, 2022). It consists of online learning modules for self-directed asynchronous learning about how to apply digital media for teaching purposes (prior, during and after the lesson). Additionally, an online community for communication and feedback among German teachers, e.g. in terms of peer review, is integrated, in order to ensure the sustainable knowledge transfer into teaching practice. In the training, the teachers become learners and experience digital e-learning scenarios from a learner's perspective, while similarly acquiring media-pedagogical and media-didactic competencies to apply these e-learning scenarios in their own teaching. This process is referred to in the literature as the pedagogical double-decker and is promoted through reflection and practical exercises with digital media in the teacher training (Herbst, Müller, Schulz & Schulze-Achatz, 2019).

To measure the overall effectiveness of the training, quality indicators such as knowledge acquisition, user experience and acceptance of online learning settings, will be examined in a three-level evaluation after the training has been completed. The first level focuses on the effects of the training, based on the feedback given by the participants. The second level measures the usage of the training, in terms practical relevance of the training content for further application in the classroom, as well as the user experience of the training. The third level holistically evaluates the type of relation between the knowledge acquisition and the overall acceptance of the training. All three levels contribute to the assessment of knowledge acquisition and ensure the implementation of this knowledge in daily teaching scenarios, which, as a result, leads to an overall learning and training success. In this paper, the results of this three-level evaluation are discussed, to answer the question of what influences the acquisition of digital skills in an online, media-didactic teacher training.

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[1] The online training consists of 5 main training modules, 2 of which have been successfully implemented so far and have been included in the study.

2. Research Background

Media-related trainings offer the possibility for teachers to understand and practice on not only new tools and media, but also to learn how to combine and integrate them in teaching processes of all subject areas. They need to be well structured to secure a good quality of learning transfer (skills and attitudes), training effectivity and participants' satisfaction (Tasca, Ensslin, Ensslin, & Alves, 2010). Such trainings usually have a strategic approach, which is linked to specific didactic and educational goals and need to fulfil specific requirements to be successful. According to the literature, there are critical success factors that must be considered in order to ensure positive outcomes of the training.

Firstly, teachers need to know exactly the reason why they should attend a training program, how this will affect them and their work and whether it has value to their teaching practices. From the very beginning, media-supported trainings should be carefully designed with specific object and clear-defined aims and structure, to fulfill the needs and expectations of participants (Ceobanu, Roxana & Asandului, 2009) and to ensure the **practical relevance of the training content** for application in classroom. The content of the training is developed in such a way, that the training duration, the well-defined and structured content, the available resources, and a supportive learning environment contribute to the overall participants' satisfaction and motivation for applying and practicing the new knowledge on praxis immediately after the training has been completed (Bundesinstitut für Berufsbildung, 2018; Ceobanu et al., 2009; Gerjets & Scheiter, 2019).

In addition, it has been shown that teachers with previous experience with digital media seemed to be more motivated during media-supported trainings and have a more positive attitude towards them and their implementation in their lessons (Collins & Liang, 2015). Therefore, **prior experience** of learners with digital media in the classroom is an important factor, which needs to be taken into account while designing an online training program.

The importance of the training relevance to learners' needs and demands, affects, and promotes their positive attitude or acceptance towards the training program (Alhabeeb & Rowley, 2017). It could also lead to increasing their motivation to learn and further develop and change their professional skills, methods, and attitude (Lipowsky, 2014). A great advantage of media-supported training programs is the combination of knowledge acquisition with exercises and practical elements within a virtual environment. Teachers are able to evaluate their own competencies and knowledge, while at the same time trying out different approaches and ways of using digital media (Altrichter, Feindt, & Zehetmeier, 2014; Lipowsky, 2014). Consequently, the **acceptance of online learning** is an important indicator of the success of online trainings and should be systematically evaluated.

When it comes to online learning, the use of different media forms that have an appealing visual and structural design, such as a combination of interactive videos, animations, applications, etc., promotes and supports the **user experience** of the training (Ceobanu et al., 2009). Learning in virtual environments also requires a reliable system quality in terms of service, technology, and technical infrastructure. The access to the system, the tools and the platform must be easy, simple to navigate (Cheawjindaka, Suwannatthachote, & Theeraroungchaisri, 2012) and available anytime from anywhere (Alhabeeb & Rowley, 2017). Furthermore, the platforms and the tools should be compatible with multiple operating systems and media (Yepes-Baldó et al., 2016). Browsing the online course pages should be easy and the training should have a well-structured functionality, good system response, good interface designs that are user friendly, leading to high usability and convenience for the user (Abdallah, Ahlan & Abdullah, 2019; Cheawjindaka et al., 2012) Therefore, the factor **user experience** plays an integral role as a quality indicator for online trainings.

A media-supported environment can enhance the communication between the participants, as with help of digital media as a communication tool it can support any kind of interaction and knowledge exchange between learners and instructors as well as between learners and between learners and the content (Farid, Qadir,

Ahmed, & Khattak, 2018). As a result, a comprehensive and interactive design with appropriate tools for **communication and feedback** might prevent users from feeling isolated while they are participating in the training. Hence, communication and the opportunity for giving and receiving feedback are crucial indicators of the quality of online trainings.

3. Research Design

As figure 1 shows, the evaluation process monitors the design of the online training in various phases using a wide variety of survey methods among different target groups. The effectiveness of the training was evaluated by using the PINBE-evaluation-model by Wuttke, Wolf and Mindnich (2009), which is suitable for media-supported training programs. It investigates different factors, which play a role before and during the learning process. The following three levels of the PINBE model (Wuttke, Wolf & Mindnich, 2009) were examined during the pilot testing of the final online training: the usage, the assessment and the effects of the online training. These steps and its results will be focused on in the current paper.

Indicator	Data collection Method	Target Group
Effects of the Training		
Acceptance of Online Learning	Online interview	Teachers
Knowledge Acquisition	Online interview	Teachers
Usage (patterns) of the training		
Feedback/ Communication	Online interview	Teachers
Previous Experience on Online Learning		
Assessment of the training		
Relevance of the Training Content for Application in Classroom	Online interview	Teachers
User Experience (Usability)	Online interview	Teachers

(Pilot Testing)

Figure 1: Evaluation process consisting of several data collection methods

During the preliminary studies carried out in the first level of the PINBE model, which are not part of this paper, main quality indicators were identified that are crucial for the design of online trainings. Based on the identified quality indicators in the preliminary studies (Paraskevopoulou, Schaarschmidt & Drewanz, 2021) the following indicators for a scientifically based development of online trainings were investigated in telephone interviews with 5 teachers:

- Communication and feedback and previous experience regarding online learning (usage of the training)

- Practical relevance of the training content and user experience (assessment of the online training by the target group)
- Acceptance of online learning and knowledge acquisition (effects of the online training)

Since the main quality indicators have already been identified in the preliminary surveys of the evaluation process shown in figure 1 and examined in the current study, the research question of this paper is: How does an online teacher training need to be designed in order to promote participants' knowledge acquisition and contribute to the improvement of digital skills?

The number of participants of the online training adds up to 67 teachers, principals and experts in the area of teacher education or media education. For the interviews, 5 teachers resp. school principals were selected; 3 of them were female and 2 were male. The teachers represent the following educational backgrounds:

- Teacher of religion at a theological-pedagogical institute (Teacher A)
- Head teacher and teacher of history and Latin at a secondary school (Teacher B)
- Teacher for math and physics at a secondary school (Teacher C)
- Teacher for German and English at a secondary school (Teacher D)
- Teacher of German and ethics at a specialized secondary school and vocational school (Teacher E)

The interviewed teachers indicated that they were able to participate in the training, because the testing period was during school holidays. Therefore, they were able to attend the training for approximately 30 to 60 minutes a day, mostly in the morning. Due to the flexibility of the training format, some teachers stated that they could also imagine using half a day or even a whole day for self-directed learning in the training. However, for most teachers it would be more difficult to find the time to participate in the teacher training on schooldays and even on evenings or weekends they could only be learning for a shorter period of time and therefore it would take very long to complete the whole course.

An interview guide with 16 questions was created for the telephone interview. The questions are based on the above mentioned quality indicators and can be assigned to 7 categories:

- Self-report of knowledge acquired
- Acceptance of online learning
- Practical relevance of the training content
- User experience of the online training
- Previous experience with online learning
- Communication and feedback in online learning

The interviews have been conducted over a period of four weeks after the teachers participated in the online training and the records were transcribed afterwards. Based on the interview guideline, categories have been determined and used to code the interview material, applying the method of qualitative content analysis according to Mayring (1994). Due to the qualitative research design, the knowledge acquisition was further distinguished into four subcategories, based on the dimensions of knowledge according to Anderson and Krathwohl (2001). The authors distinguish between 1) factual knowledge as terminology or basic elements, 2) conceptual knowledge as knowledge of principles, theories or models, 3) procedural knowledge as knowledge of criteria for using skills or techniques and 4) metacognitive knowledge as awareness of one's own cognitive processes (Wilson, 2016). Since factual and conceptual knowledge cannot be clearly distinguished in the interview transcripts, these two dimensions are combined in the following analysis. This subcategory of knowledge acquisition describes knowledge about concepts and models addressed in the training.

Furthermore, in the interview analysis, application-oriented knowledge is used instead of procedural knowledge, since it refers to knowledge that can be applied in the classroom, but also to knowledge about tools or websites that can be used to support the application of what has been learned. According to the definition by Anderson and Krathwohl (2001), metacognitive knowledge describes the reflection on one's own teaching and learning process with digital media. The last category does not refer to the dimensions of knowledge according to Anderson and Krathwohl. Rather, this subcategory describes that no new knowledge was acquired, but only prior knowledge was recalled and consolidated. The interview results are reported in the next chapter. Each of the four categories associated with the acquisition of knowledge will be referred to, by using specific color-coding as shown in figure 2, to indicate the forms of knowledge each interviewed teacher acquired.[2]
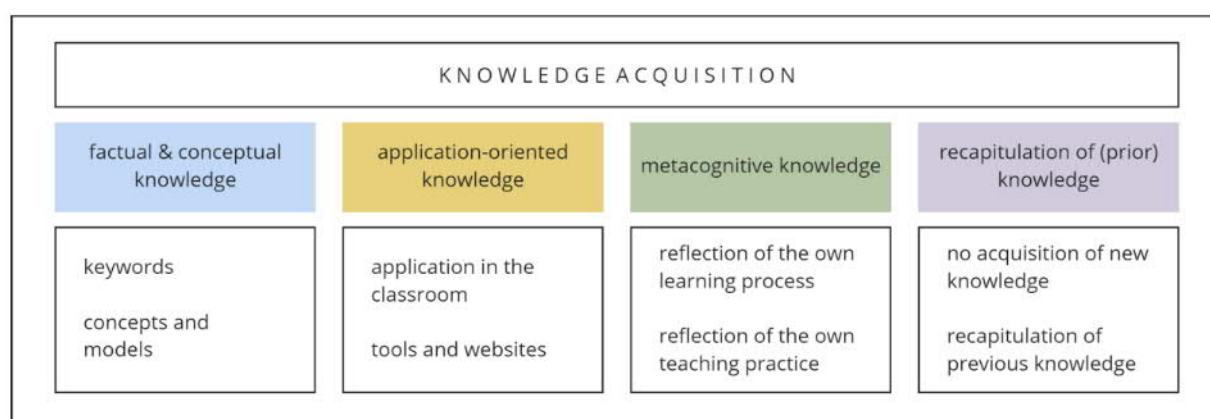
Figure 2: subcategories of knowledge acquisition

4. Results

4.1 Assessment of the training

Teacher A

The learning outcome in terms of acquired knowledge of teacher A can be described as a combination of factual & conceptual and application-oriented knowledge about the topics the teacher prioritized in the process of learning in the online course. When talking about the learning contents, the teacher focused on aspects that may be of use in their daily work, while still being able to name and explain essential keywords that were addressed in the training.

The format of the training program as an online course is considered particularly useful for content that covers basic knowledge about teaching with digital media.

Especially for participants that are not as experienced in using digital media in their classrooms, the training setting allows for learning the basics in a self-paced and self-directed way. Generally, the availability at any time is considered a great advantage of online learning. However, the teacher also stated that face-to-face trainings are more effective than online trainings when it comes to more application-oriented content, such as applying tools into practice or working cooperatively as well as learning from each other to improve teaching.

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[2] All icons are by "Piksart", licensed under CC BY 4.0, edited by "UndiMeS".

The contents of the teacher training are meant to be hands-on and useful for daily teaching practice of schoolteachers. In the Interview, the training participant confirmed that the learning content is applicable and real-life use cases are addressed to provide guidance on how to use digital media in the classroom. Furthermore, according to teacher A, the topics covered in the training are relevant for teachers as well as their students.

Regarding the user experience of the online training, the course structure is perceived to support learning through competence-orientation, by stating learning objectives in the beginning of each course unit. Moreover, the implemented entry test further promotes the learning process since previous experience is taken into account and specific topics are recommended based on that. Detracting from the positive learning experience was the design of some of the exercises that were part of the training. The teacher mentioned that the wording was confusing at some point and should be revised. However, the overall layout of the course is perceived to be very appealing and the interactive design is considered intuitive.

The online community as the second element of the training besides the online course, was not used at all by teacher A. On the one hand, time capacities during the testing period were too short and on the other hand there was no need for feedback and communication during the learning process.

Teacher A had previous experience with online learning courses as well as implementing digital media in schools and teaching. Due to the pandemic in the last few years, many face-to-face training courses were moved to the digital space and held via Zoom. Additionally, they completed web-based modules regarding specific topics on digital media in schools. Although the teacher had participated in those online trainings, they indicated that no previous training took place in the specific format of the training that was tested.

Teacher B

Teacher B had a lot of previous knowledge about the topics of the training program. According to teacher B, much of the basic content of the first modules is mostly already known to teachers who already use a lot of digital media in their classes, even though the interviewee felt like they could not exactly describe with their own words the theoretical concepts that were presented in the training. Rather, they reflected on their own learning process on a metacognitive level and were able to compare this understanding with the attitudes and behavior of their students when it comes to learning with digital media. Therefore, metacognitive knowledge was obtained alongside the actual content about online learning and learning management, as it is intended in terms of the pedagogical double-decker in the training program.

The reflection of the own learning process when it comes to online learning was due to the specific format of the training. Teacher B stated that for them the online setting lacks direct feedback and the possibility for synchronous communication to discuss and exchange ideas with other participants. This can only take place in face-to-face settings. Furthermore, the commitment to complete the course is not as high in online self-study settings. Therefore, the teacher would prefer a mix of both formats to learn the content by themselves and also to discuss and reflect on it afterwards with other participants in a face-to-face (online) environment. This way, small learning groups could be formed to increase commitment. Even though the flexibility of online learning settings when it comes to time management is advantageous compared to face-to-face environments, the lack of commitment is still problematic.

However, the content of the modules is considered to be relevant for both lesson-planning and -teaching, as the most important aspects on the topics are summarized in the learning units. Especially the content of the

second (media-didactics) of the five modules[3] is well applicable to teachers' professional requirements, while module one is more theoretical and covers more basic concepts.

One aspect of the online training that supports learning by increasing the user experience, is the assessment test at the beginning of the course, which provides the basis for assessing prior knowledge on digital media in teaching. Moreover, the mix of media when it comes to learning content, further supports the learning process, even though audio and video files could still be implemented more often, according to teacher B. However, like teacher A, teacher B also mentioned that the design of some exercises should be revised to improve the user experience. In this regard, hands-on exercises with follow-up questions are considered to support learning, but the lack of feedback, especially in reflection tasks, was mentioned as a limiting factor. Possible additional functional options in the training to support the learning process could be a reminder to complete the course to enhance commitment, or an indicator of progress and the possibility to download the learning content. Other than that, the design of the course is appealing, and the handling is very intuitive.

Teacher B did not use the online community of the training to connect with other teachers. The main reason is the asynchronous character of it and therefore not getting feedback instantly. For the interviewee, the only reason to be part of the community in the future would be to organize a learning group and synchronous online meetings with other participants.

Regarding previous experience with online training programs, the teacher indicated that they attended synchronous trainings online and widely, and successfully implemented digital media in the school and in the classes as well.

Teacher C

In learning, teacher C focused on the media-didactic module and mainly acquired application-oriented knowledge. The teacher indicated that they had a lot of previous knowledge about the training contents, but still got helpful tips and learned how to apply certain tools to improve their own teaching.

The interviewee preferred the training as an online course rather than a face-to-face environment. For their learning process, especially the asynchronous character of the online setting was very helpful. Moreover, the format allowed flexible time management and thus shorter learning times in between, rather than having a full day of training, as it is often the case with face-to-face trainings. Another positive aspect is that there was no longer the need to go to a specific place, as they could take part in the training from anywhere.

According to teacher C, the training content is relevant and applicable to real-world teaching scenarios. The implemented contents do not only address factual & conceptual knowledge but also are rather application-oriented and the exercises are designed in such a way, that the results can actually be used in one's own teaching. The only reason for teacher C not to apply the acquired knowledge is a lack of time on schooldays and the additional workload that the application would entail.

Even though teacher C personally would prefer another design, the user experience of the online training is considered easy to use and very intuitive.

However, teacher C did not use the online community either. The interviewee did notice the community, but there was no need to use it, because no problems occurred during the learning process and there was no need for communication.

Like the other interviewees, teacher C attended synchronous online trainings during the pandemic and their affinity with online courses is very high, due to the previously mentioned reasons. Likewise, teacher C has

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[3] Only the first and the second module were part of the testing.

previous experience and a high level of media use in the classroom and indicates how digital media helps to improve their teaching.

Teacher D

Teacher D did not attend the training in detail, but only got a rough overview of some topics. The learning outcome in terms of knowledge acquisition can be described as a recapitulation of prior knowledge, as they stated that they mainly have reactivated the understanding they already had of the concepts covered in the training. At the same time, acquiring factual & conceptual knowledge, such as different theories or models, was not a priority for teacher D.

Regarding the format of the training, the teacher noted positively that the online setting allows flexibility in terms of learning time and choosing particular learning content. The learners can decide for themselves, when to learn and which topics to deepen or skip altogether. Nevertheless, the teacher prefers learning settings that allow for synchronous discussion and direct feedback and exchange of ideas in real life. Especially for fundamental topics and questions regarding digital media in the classroom, discussion with colleagues is more important for teacher D than self-directed learning by themselves.

The interviewee also stated that for the most part, the training content was not relevant for their own teaching. Rather, the contents are more theory-oriented and academic than application-oriented. For teacher D, the training lacks reference to the curriculum as well as to topics specific to the taught subjects. The interview prefers teacher trainings that contain synchronous teamwork to generate an outcome that is directly applicable for their lessons. Therefore, in the currently tested training at least the linked tools and websites for organization and finding teaching material are useful for teacher D.

Similar to the other interviewees, teacher D criticized the faulty feedback in some of the tests in the training. Apart from that, the user experience was perceived to be good, due to the appealing design and the easy orientation and operation.

Since the interviewee prefers direct and synchronous feedback and communication, the online community was not used for posting or contacting other training participants.

Due to the pandemic, teacher D has previous experience with synchronous and asynchronous online trainings. Those were mostly thematically oriented to the curriculum and only took a few hours. In addition to that, Teacher D sometimes already uses digital media in the classroom, and their school is committed to promote the use of digital media.

Teacher E

Teacher E completed the whole training that was available online so far. The acquired knowledge is both factual & conceptual and application-oriented, as they recalled specific media-didactic and media-use models as well as the practical content and its' application. Moreover, the teacher acquired metacognitive knowledge, as they indicated that they reflected on their own attitudes towards online learning. Furthermore, positive attitudes towards the application of what they had learned, have been reinforced. In addition to that, not only new knowledge was acquired, but the existing prior knowledge was recapitulated and consolidated as well.

For the interviewee, the online format was a key reason for attending the training. They preferred the asynchronous online setting of the training to a synchronous face-to-face environment. The advantage of the online format, according to the teacher, was the flexibility due to self-determined time management, while

still being able to pause the learning process if there was no time available for continuing the training. As a result, they were able cover more topics than it would have been possible during a face-to-face setting.

Regarding the application orientation of the training, teacher E stated that they were already able to use some of the content for their lessons and the lesson planning and that it facilitated the daily work as a teacher.

According to teacher E, the user experience of the training helped to promote learning. While the design is appealing and the training was easy to use, the structure promotes learning by combining inputs with quizzes and tasks to ensure an increase in knowledge and skill development. Some aspects that affected the user experience negatively were on one hand the amount of resources consumed, which limits mobile learning because the course uses a lot of battery and computing power, and on the other hand faulty feedback of some tests, which leads to frustration.

In comparison with the other interviewees, teacher E has used the online community that is associated with the teacher training. However, they did post something in the community environment, but noticed that there were no other users in the community by that time. Teacher E indicated that they would only use the community if it would benefit them personally. However, they are already well connected and would rather use one of the already existing teacher communities, such as creating a hashtag on Twitter or a padlet for collaborative work and communication.

Due to the affinity for digital media as well as the pandemic, teacher E has previous experience with online trainings, although most of them took place in synchronous settings. Besides, in their school, the interviewee is part of a work group, which deals with digital teaching to establish a new teaching culture.

4.2 Effects on knowledge acquisition

Previous experience with online teaching and online learning

Due to the pandemic over the last few years, the need for online teaching and online learning has increased. As a result, most teachers were forced to move their teaching into the digital space. Similarly, teacher trainings have also been held online. All the interviewed teachers already had experience with both learning and teaching in the digital space, so that knowledge was either acquired or recapitulated and consolidated during the training. However, the online trainings they attended before differ in format and length. While some teachers mostly participated in synchronous online trainings, others already attended asynchronous e-learning courses. Although the specific format of previous online learning courses or training was not the focus of the interviews, it can be assumed that there is a correlation between previous experience and acceptance of the teacher training, which further affects the overall knowledge acquisition.

Practical relevance of the learning content

The perception of whether or not the training content is applicable in the classroom, affects the knowledge that is acquired in the process of learning. A perceived lack of practical relevance of the training content limits the acquisition of new knowledge. In fact, only prior knowledge can be recapitulated. However, if the learning content is considered relevant for the participants, factual & conceptual knowledge as well as application-oriented knowledge can be acquired and own learning processes or teaching practices can be reflected upon.

User experience

Since the user experience is considered positive by all the interviewees, it may function as a promoting factor for the acquisition of knowledge. However, it seems that user experience is not the most significant factor when it comes to acquisition of knowledge: On one hand, user experience was positively evaluated by a teacher, but no new knowledge was acquired. On the other hand, teachers who criticized the functionality of

some functions, such as faulty feedback, or preferred a different design were still able to acquired new knowledge.

Feedback & communication

The analysis of the interviews shows that the need for feedback and communication is closely linked to the acceptance of the teacher training as an asynchronous and online e-learning course. In particular, the need for synchronous communication and direct feedback varies between the interviewed teachers. Some teachers indicated their preference for learning online in a self-directed way and did not feel the need to discuss the learning content with other teachers or get direct feedback. Those teachers acquired factual & conceptual or application-oriented knowledge, and some even additionally reflected on their teaching and deepened their prior knowledge. Other teachers emphasized the lack of direct feedback and synchronous communication in the asynchronous online setting, claiming that they would need these aspects for successful learning, engagement and commitment in the learning process. Thus, the online community that is part of the training was not used. The teachers did recapitulate prior knowledge or reflected on their learning and teaching processes but did not acquire new knowledge in terms of factual & conceptual or application-oriented knowledge.

Acceptance of online learning setting

Since the acceptance of the format is closely related to the need or no need for synchronous feedback, acceptance varies depending on how well this is addressed in the online teacher training. Those teachers, who prefer the asynchronous nature of the training and therefore time flexibility to online learning in synchronous settings, acquired application-oriented knowledge. They did not feel the need to seek direct feedback or discuss the learning content with other training participants and were therefore able to acquire new knowledge through self-directed and independent learning. Nevertheless, it was also shown that the acceptance of the format enables reflection on one's own learning and teaching practice and leads to metacognitive knowledge, in the sense of the pedagogical double-decker.

However, some teachers consider the online format suitable only for the acquisition of factual & conceptual and basic knowledge. If this was the learning goal of the participants, those dimensions of knowledge have been acquired, but other formats would have been preferable for acquiring knowledge on how to apply what was learned, in the classroom.

For those teachers who showed a lack of acceptance for the online training due to the lack of direct feedback and synchronous communication but participated to learn about how to implement digital media in the classroom in an application-oriented way, no new knowledge was acquired. Rather, they reflected on their own learning and teaching with digital media and acquired metacognitive knowledge, in terms of the pedagogical double-decker or only recapitulated and consolidated knowledge they already had about the addressed topics.

Figure 2 illustrates how the characteristics of quality indicators influence the knowledge acquisition. The solid lines indicate an indicator's centrality, and dashed lines indicate the subordinate importance to the knowledge acquired. The figure shows, that the need for direct feedback and synchronous communication is strongly associated with the acceptance of the online learning format of the training. Moreover, a lack of acceptance and a perceived lack of practical relevance hinders the acquisition of new knowledge.
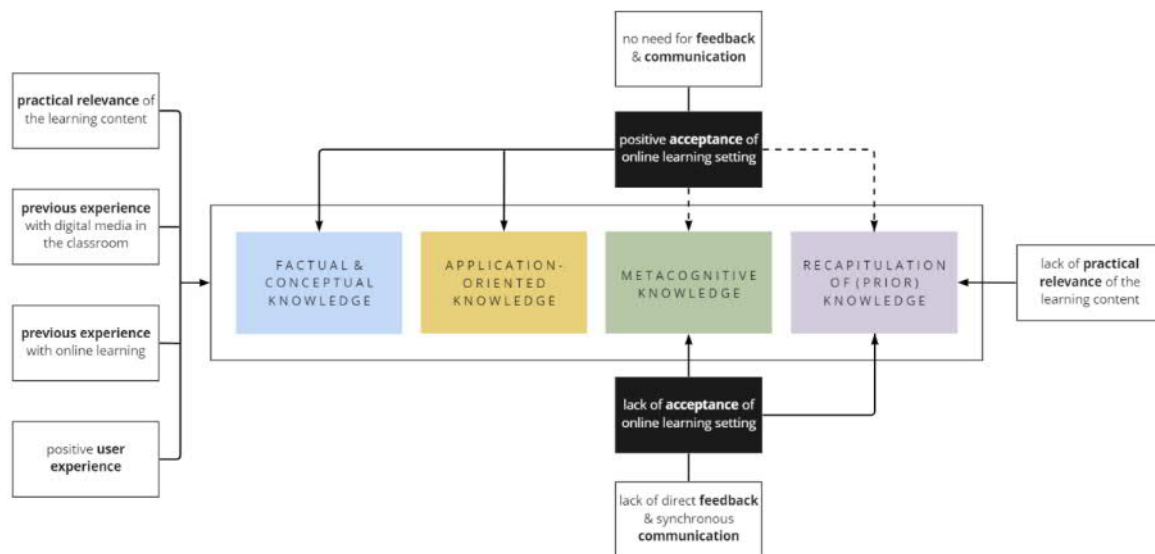
Figure 3: Effects of the examined quality indicators on knowledge acquisition

5. Conclusion

Considering the interviews with the participants, it can be said, that the online training in the first piloting stage reached teachers who already had experience with online learning and teaching with digital media. As a supporting but not decisive factor, positive user experience can be understood as another quality indicator promoting knowledge acquisition.

However, it was shown, that the acceptance of the asynchronous online format of teacher training is crucial for the acquisition of new knowledge and for skill development, in order to apply what has been learned in the classroom and in daily practice. Regardless of acceptance, the training supports reflection on one's own learning and teaching practice in the context of digital media, as was intended with the pedagogical double-decker.

A lack of acceptance of the training format by some teachers can be attributed to the lack of direct feedback and synchronous communication. The interviews showed that no new knowledge in the form of factual & conceptual and application-oriented knowledge was acquired when the online format of the training was not accepted. Therefore, the communication opportunity through the integrated online community should be emphasized more in the future in order to meet the needs for feedback and communication of some teachers and hence to promote acceptance and the acquisition of new knowledge.

Finally, in further research projects, prior experience should be considered in a more differentiated and detailed manner in order to investigate the relationship between prior experience and acceptance of asynchronous online training. In this way, acceptance and thus the related acquisition of new knowledge can be promoted further.

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Kaïros: the why, what and how of a digital learning platform

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Abstract

This paper describes the origins, functioning, and content of Kaïros, a learning platform aimed at developing digital skills. Currently, most digital skills platforms seek to position or assess users' skills, offering a set of questions, with links to external, separate content resources. Kaïros is inspired by language learning software and supports problem-based learning through questions and integrated courses. A great autonomy is left to the students who can choose their own learning path. They can start with the questions or the course, follow the suggestions of the algorithm based on a positioning test, let their specific needs determine the topics, or let their curiosity lead the way. The paper describes the choices made and the challenges faced during the development of Kaïros, providing a useful framework for the development of such a learning platform.

Keywords: learning platform, DigComp 2.2, digital skills, algorithm, pedagogical principles, active learning, personalized learning, higher education.

1. Introduction

Since the 2020 pandemic, the need for learning platforms and technologies has naturally increased (O'Brien & O'Ceallaigh, 2021). Kaïros is one of these learning platforms, currently in active development. The aim of this paper is to describe and criticize the origin, purpose, and functioning of Kaïros, using the Golden Circle model suggested by Simon Sinek (2009). The "WHAT" focuses on the product or service offered to users, in this case, the content of the learning platform. The "HOW" translates things that make it special or different. Finally, the "WHY" is the purpose, cause, or belief underlying the project.

2. Why develop a learning platform for digital skills?

The digital transformation underway is reshaping our daily life and society (European Commission, 2020). Today, in Switzerland, there are few sectors left that digital technologies have not invested. As a result, there is an increasing need for digital competences to work, communicate, participate in society, etc. In this context, education plays a fundamental role by creating knowledge and training necessary competences (SEFRI, 2017). Indeed, continuous learning and improvement, which happen more and more often online, are key elements to take the digital turn.

Kaïros is part of a project to develop digital competences for teaching and learning in higher education. In 2016, the Swiss government published its strategy "Suisse numérique" (translation: "Digital Switzerland"), which aims to make the most of the opportunities that digitalization offers to society and the economy, as well as the related action plan (Conférence suisse des hautes écoles, 2018). The following year, it adopted the report's recommendations about the main framework conditions for a digital economy. Based on these documents, the state secretariat for training, research, and innovation (SEFRI) identified the strengthening of digital skills in education as one of the primary scopes of action. Hence, the "P-8: Strengthening digital skills in education" program was launched by swissuniversities in 2019 (swissuniversities, 2019). To take part in this program, Swiss higher education institutions had the opportunity to submit projects in the following areas (Conférence suisse des hautes écoles, 2018):

- Support higher education institutions in their efforts to adapt to the challenges raised by digitalization;
- Support and launch innovative projects aimed at strengthening the digital skills of teachers and students;
- Prompt Swiss higher education to allow and encourage internal adaptations and internal developments;
- Allow and encourage sharing of best practices.

Obviously, the overall program aims at strengthening digital skills over the long term, beyond the time frame of the project (2021-2024). Indeed, given that digital skills are destined to become more and more present in our personal, societal, and professional lives, durability is an important criterion for the selected projects. Within this context, UniDistance submitted a project named "Future University" (https://wp.unil.ch/digitalskills/) together with the University of Lausanne, with the objective to develop digital competences for teaching (axis 1; focus on educators) and learning (axis 2; focus on students) in higher education.

One of the learning tools developed in the axis focusing on students is Kaïros – the focus of this paper. Kaïros is a self-directed and self-paced learning platform that goes beyond the existing tools. Indeed, several training platforms currently exist such as "Europass" which aims to identify digital competences, "TOSA" which aims to develop digital competences, or "PIX", which aims to certify digital competences. However, none of the existing products offer a complete answer to the need to identify, develop, and certify students' digital skills.

Furthermore, not only can Kaïros be used for learning specific digital competences or getting certified, but also for developing students' digital culture and competences in a lifelong learning process (without certification purpose). Now that we have established the context within which Kaïros has been developed and its aim, we will look at **how** the tool was designed.

3. How is the Kaïros learning platform being built?

Kaïros is based on the European Digital Competence Framework for Citizens (DigComp 2.2). This framework identifies five competence areas: 1) Information and data literacy, 2) Communication and collaboration, 3) Digital content creation, 4) Safety, and 5) Problem solving (Vuorikari et al., 2022). Within each competence area, key digital skills are described leading to a total of 21 skills. As the DigComp 2.2 has been validated at the European level and is recognized internationally, Kaïros covers nearly the same competence areas. The competence areas one (Information and data literacy) to four (Safety) have been translated and adapted to our audience and institutional context, i.e., Swiss higher education students. Each skill is broken down into three levels: elementary, independent, and experienced, with its own, adapted learning objectives (table 1). The fifth competence area (Problem solving) of the DigComp 2.2 (Vuorikari et al., 2022) includes skills underlying many of the other skills covered in the four others competence areas, as well as the operation of Kairos. Hence, most of its content is embedded into the four other competence areas, and not developed as individual skills.

Table 1: example of a competence: collaborating through digital technologies.
To use digital tools and technologies for collaborative processes, and for co-construction and co-creation of data, resources, and knowledge.

Elementary	Independent	Experienced
I am able to : • Identify some tools and digital technologies to collaborate	I am able to : • Select the most appropriate tools and digital technologies to collaborate, according to a specific situation	I am able to : • Suggest different tools and digital technologies to collaborate • Use the most appropriate tools and digital technologies for the co-construction and co-creation of data, resources, and knowledge.

Kaïros draws from existing online learning platforms. Numerous offers already made available were tested and analyzed while conceptualizing the tool. Then, they were benchmarked to benefit from the interesting features of the different tools while matching them with the pedagogical principles behind Kaïros.

It is the student who learns and he alone (Meirieu, 1985). Choices made by software designers as well as those of teachers never succeed in making a student fit into a particular mould. Indeed, always learning consists of thwarting the prognostications and projects of educators (Meirieu, 1996), is an act of revolt against all confinements, a fortiori the algorithmic prisons. Therefore, the pedagogical choices made are student-

centered and take into account educational research, for example by considering that what teachers think students do and what they actually do may considerably differ (Goodyear et al., 2021).

Concretely, the learning platform aspires to respect the principles of good teaching practice of Chickering and Gamson (1991) as well as the current knowledge on motivation. In this respect, Kaïros aims to encourage active learning, give prompt feedback, communicate high expectations and respect diverse talents and ways of learning (Chickering & Gamson, 1991; Arbaugh & Hornik, 2006). In addition, Kaïros aims to stimulate motivation by respecting everyone's zones of proximal development (Vygotsky, 1934/1997; Yvon & Zinchenko, 2012), by being as clear as possible about expectations, providing different levels of challenges, and rewarding effort and achievement (Locke & Latham, 1991).

Some of these pedagogical aspects are developed hereafter:

- **Active learning:** Knowledge emerges from our relationship with the external world; knowledge is above all the solution to a problem, a solution to be constructed by trial and error (Dewey, 1938/2015; Meuret, 2007; Halpern; 2018). Hence, Kaïros emphasizes active learning by developing digital skills through problem-solving. Indeed, students complete real-life tasks to answer most of the questions and thus practice the relevant skill – they learn by doing (Dewey, 1938/2015). For example, they are asked to use specific software to check if there are traffic jams around a given city. Some questions also concern digital culture in general and thus are more abstract.
- **Personalized learning:** As mentioned above, Kaïros is a student-centred tool. Referring to Deci and Ryan's self-determination theory (2012; 2017), students can choose their own learning path and more specifically, how much support/autonomy they need to learn. Indeed, the learning platform does not assume a unique approach but encourages individual experimentation (Dewey, 1938/2015; Dejean, 2011). Students can 1) follow the path suggested by the algorithm or 2) take the lead and select the skills they would like to develop. When choosing the first option, students can decide at any time to walk out the path suggested by the algorithm to make their own choices. Some students may prefer to learn from the course content, while others may prefer to test their current knowledge before accessing the course. The algorithm considers students' knowledge and constantly adapts to their proficiency level. Thus, students who already have knowledge about a skill are offered a variety of exercises, while students who are struggling with a specific topic can further consolidate their knowledge. All students can consult a hint or access the full course from the questions when they face a problem. Here, the principle is to optimize autonomy and respect the zones of proximal development of each student (Vygotsky, 1934/1997). Indeed, Kaïros considers that each student is an expert on his/her own needs. Moreover, Chickering and Gamson (1991), as well as Arbaugh and Hornik (2006), highlighted the importance of respecting diverse talents and ways of learning in an online learning environment. As claimed by Vygotski (1934/1997), learning that is supported today will be independent tomorrow.
- **Nature of cognition**: The algorithm is being developed with the idea of optimizing learning. To do so, it considers the Ebbinghaus' forgetting curve (Choffin, 2021) and the limited human capacity for information processing (Florès et al., 1970). Thus, the algorithm supports distributed learning which is more efficient in terms of information retention than mass learning (Florès et al., 1970; Brown et al., 2014; Mathy, 2022), and facilitates transfers by suggesting questions that are conceptually similar or associable with the previous ones (Vianin, 2009).

- **Acceptance of ignorance:** Kaïros is based on the postulate that it is not necessary to demonstrate that one knows everything to prove that one is competent. From this point of view, students face different questions within a given competence area but are not tested on all skills included in this area.
- **Good practices for giving online feedback**: Feedback is a central part of teaching. Good feedback informs, instructs, and offers suggestions to transform errors into successes (Leibold et Schwarz, 2015). Kaïros gives corrective feedback after having answered a question (figures 2 and 3) and suggestive feedback with a hint for each question. As suggested by Leibold and Schwarz (2015), Kaïros aims to offer frequent, immediate, specific, and positive feedback.

Now that we have a good overview of the framework and pedagogical principles on which Kaïros has been built, we will have a look at **the tool itself**.

4. What can be found on the Kaïros learning platform?

As both the learning materials offered in Kaïros and the platform itself are currently under development, this section will present 1) what has been developed so far, and 2) what will be developed in the coming months.

4.1 What has been developed so far?

On the IT side, the development of the back end and the front end are relatively independent. The back end allows the project team to create and edit the content offered on the learning platform, define the parameters, and implement the algorithm. The front end is about what students can see and use, as well as their interaction with the learning materials. The project team also started to reflect on questions regarding data maintenance efficiency within a headless LMS approach. Although IT development is essential to the project, this paper focuses on digital skills development. Hence, we will now look more into the students' experience to learn and the project designers' experience to design the platform and develop learning materials.

From the students' perspective

The first time students access the platform, they choose the language of their training (currently French or German; English to be developed). The first question appears, and students are directly immersed in the quiz – the training starts. It is a bias toward active learning to start the experience with the questions and not with the lecture.
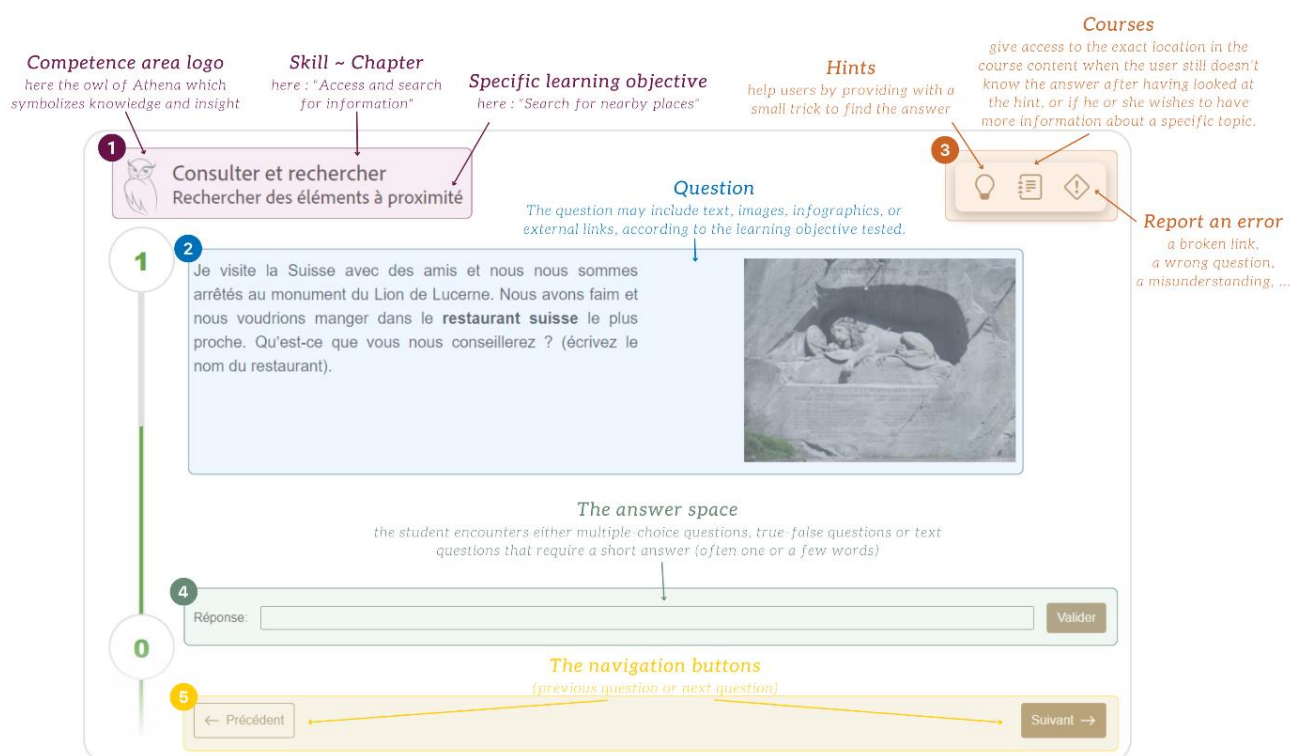
Figure 1: Example of a question. Kaïros learning platform (French version)

Figure 1 shows the user interface when answering a question. The content framed in purple (1) indicates the competence area (represented by a logo; one logo per competence area) as well as the skill, and the specific learning objective tested by the question. In the example above, the logo is the owl of Athena which symbolizes knowledge and insight and references the competence area "Information and data literacy". The skill "Access and search for information" corresponds to the first line of text, and the specific learning objective to the second line of text.

The content framed in blue (2) is the question itself. As mentioned previously, many questions require completing a task to find the answer. Thus, this space can include text, images, infographics, or external links, according to the learning objective.

The content framed in orange (3) allows students to access resources when they don't know the answer to a question, as well as to report an error (exclamation mark). Two types of resources are available:

- Hints (bulb icon) help students by providing a tip to find the answer. The hint in the example above is the following: "You can search for items near a location on Google Maps". Therefore, students are directed to Google Maps to help them answer the question.
- The book icon gives access to the course, at the exact location of the relevant information. It can be useful to students when they don't know the answer after having looked at the hint, or if they wish to have more information about a specific topic. Once they have accessed the course, students have the possibility to browse through its content. They can come back to the quiz when they found the necessary information. The course interface will be presented later in the section (figure 5).

The content framed in green (figure 1, number 4) is the space where students write their answers. Then, they receive immediate feedback as follows (figure 2 and figure 3):

Figure 2: Example of feedback to a correct answer. Kaïros learning platform (French version)

Figure 3: Example of feedback to a wrong answer. Kaïros learning platform (French version)

Finally, the buttons framed in yellow (figure 1, number 5) allow students to navigate from one question to another. After answering 9 questions, students obtain a summary of their results in the form of a set of labels or a list (figure 4). At a glance, they can see the proficiency level of the questions (represented by a dice with 1, 2, or 3 dots), and the topics that are acquired or still need practice (represented by a green or red indication). They can review the full question by clicking on the corresponding label. When the review is over, students can continue with the next 9 questions, and so on.
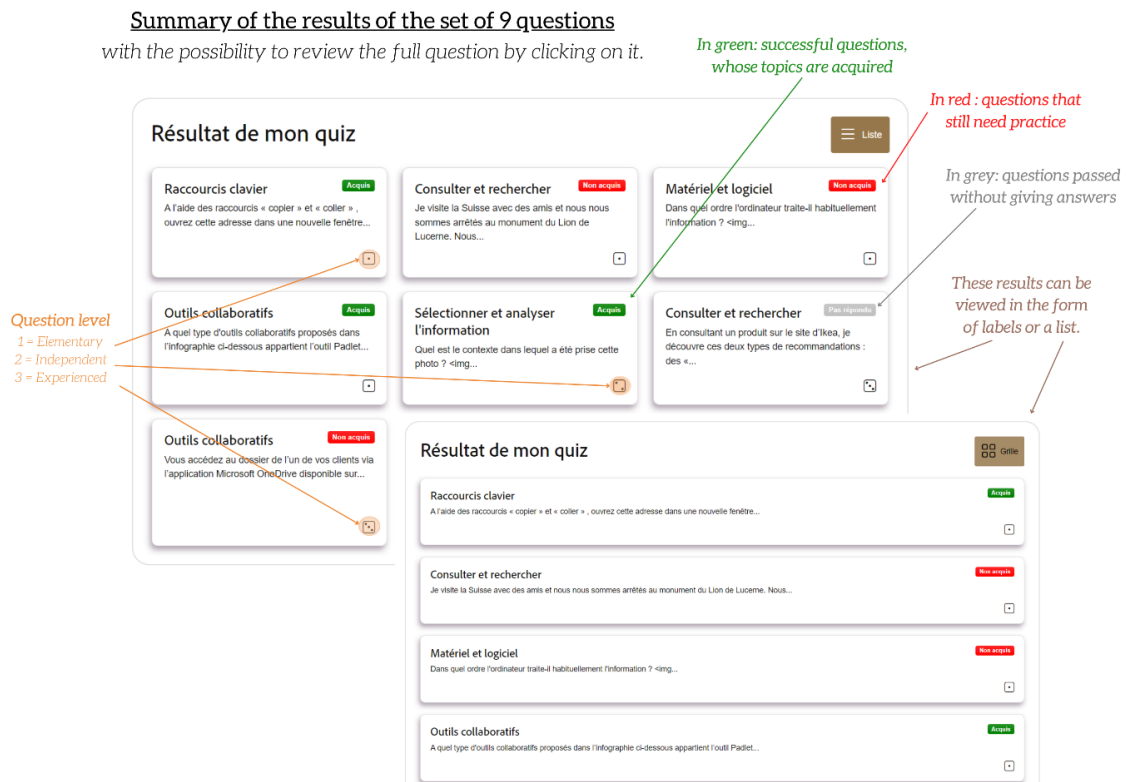
Figure 4: Example of a summary of the results. Kaïros learning platform (French version)

As mentioned earlier in the paper, students can access the course at any time. Figure 5 shows the course interface.
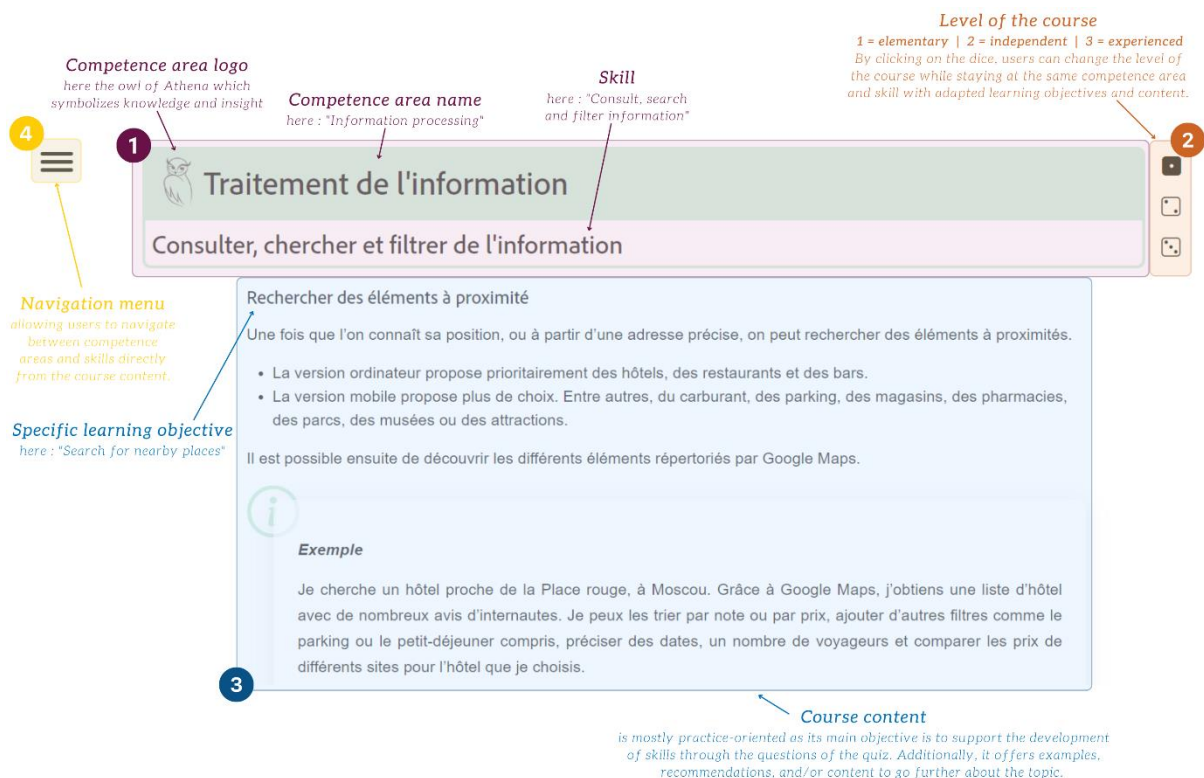
Figure 5: Example of a piece of course. Kaïros learning platform (French version)

The content framed in purple (figure 5, number 1) corresponds to the competence area and the skill covered in the course. As explained previously, the questions of the quiz are directly linked to this information. The content framed in orange (figure 5, number 2) indicates the proficiency level of the course the student is currently exploring. Each course is developed in three levels with adapted learning objectives and content: elementary (dice with 1 dot), independent (dice with 2 dots), and experienced (dice with 3 dots). By clicking on the dice, students can change the level of the course while staying in the same competence area and skill. The course content (figure 5, number 3, blue frame) is oriented toward solving the problems provided in the questions. Therefore, it has a practical dimension allowing the concrete development of a specific digital skill. Additionally, it offers examples, recommendations, and/or content to go deeper into the topic. Lastly, the navigation menu opens by clicking on the three horizontal lines (figure 5, number 4, yellow frame), allowing students to navigate between competence areas and skills directly from the course content.

From the project team's perspective

The project team is working mainly on three dimensions of the learning platform. The first one is the back end environment, and more specifically the editing application. Indeed, this is the tool used to create learning materials (i.e., questions, course content, hints, and feedback). The technical part is carried out by two computer programmers, while other people on the team as well as external experts create learning materials. The second dimension concerns the design, features, and aesthetic issues in which the whole team is involved. Finally, the third dimension is the front end environment. Indeed, our computer programmers are working on creating a user-friendly and accessible user interface. Part of the choices made regarding the second and third dimensions can be seen in figures 1 to 5.

4.2   What are the future developments and challenges?

As mentioned at the beginning of this paper, this project started in 2020 and Kaïros is currently under development. There are still many challenges to be overcome. These can be classified into five overlapping topics: algorithm, user-friendly design, features, dissemination, and student inclusion.

Firstly, the development of the algorithm for Kaïros is a real challenge that currently generates more questions than answers. How to model pedagogical principles found in the literature within an algorithm? How to provide questions whose difficulty respects each student's zone of proximal development? How to set the parameters of the algorithm to respect the curves of forgetting or distributed learning? How to set the parameters of an algorithm which can question itself and learn to adapt to each student and each way of learning?

Secondly, creating a user-friendly design is an extremely resource-consuming task. Most of the work remains to be done. For example, a home page needs to be developed to welcome students and allow them to choose their own learning path as defined in the pedagogical principles underlying Kaïros. The overall graphic design should be homogenized to create a specific universe for Kaïros. It will also be necessary to test and work on the accessibility of the learning platform.

Thirdly, many features currently exist on paper or in the mind of the project team but still need to be developed. One of these features is a question box that allows students to record the questions that they find difficult, interesting, or that they want to review later. Another feature is interactive graphs that would provide motivating views on the proficiency level reached for a specific skill. The last example would be gamification features such as a progression bar, badges, etc.

Fourthly, it will be necessary to explore the factors leading teachers to test or use Kaïros in order to make it an acceptable and accepted tool for the community (Marlin et al., 2022). The Extending Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2012; Alomary et Woolard, 2015) could be used for this analysis. With a view to disseminating Kaïros as a learning tool to other institutions, the issues of accessing the learning platform and filtering or setting up content according to students' profiles are still being considered. Currently, the main course being created on Kaïros is about the development of digital skills. The visibility of the learning platform is therefore limited for the time being, especially because the content has not yet been published. However, some partnerships are currently under discussion to 1) provide access to Kaïros to interested Swiss higher education institutions, and 2) use Kaïros as a learning tool for other educational content at UniDistance Suisse (from a specific course to a staff training).

Finally, the idea of including students in the creation of learning materials is still at an embryonic stage. The benefits of participating in the construction of their learning environment on student engagement are well documented (Perrenoud, 2014). Any learning tool can co-evolve with students-users (Fichez & Varga, 2006). Indeed, being at the center of the learning experience, they are the best players to counteract the unavoidable misconceptions and biases of a project team.

5. Conclusion

Digital skills are already essential in our daily life and society and will become even more critical in the future to be able to grow and act as citizens. Education has a key role to play in this issue and universities along with other educational institutions have a responsibility to make this knowledge and these skills accessible. Given the context of the "Future University" project, the primary audience for Kaïros is the Swiss higher education community, although the general population could also benefit from the resources created. Indeed, Kaïros could become a tool of public utility with a positive societal impact over the long term, but there is still a long path ahead.

Among the upcoming issues, the main considerations focus on algorithmic design, accessibility (and fairness), user-friendly design, and recognition issues. The open questions are innumerable, but a handful of assumptions keep things on track. Two postulates, which seem like self-evident facts, conclude this paper:

1) Technology must remain at the service of pedagogical principles and not the opposite (which is often tempting).
2) It is necessary to allow students to counteract the misconceptions and bias of any project team who creates an algorithm (O'Neil, 2017), for example by allowing them to follow their own path. This is a high-stakes ethical issue.

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Resilience-Building Skills in order to face the 21st century challenges in the new-normal workplace and educational environment

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Abstract

The recent pandemic of covid-19, caused various crises in domains like public health systems, governance, economy and education. This multi-layered crisis has tested the resilience of public policies, communities, economy and individuals. This challenge highlighted the need for the development of political resilience in the public sector and higher education as well. The concept of resilience has been widely encountered in the last decade, as psychologists, political scientists, ecologists, economists, sociologists and those involved in public policies and education deal with the topic, mainly due to natural disasters, the climate crisis, the pandemic and their outcomes. The training Institute (INEP) of EKDDA focused on improving the social and administrative skills of civil servants, based on the principle that change starts with people, working at the same time with public bodies in training and education.

The article attempts to trace the ways in which training can support a coherent policy of resilience in the public sector and higher education by empowering individuals and teams based on three key elements: shared awareness of goals, teamwork and the ability to prepare and act in response to a crisis by enriching training programs and higher education curricula, reinforcing resilience skills in organizations and individuals. The key questions will be focused on:

- ✓ What is resilience in relation to organizations and individuals?
- ✓ What kind of training programs could be developed in order to teach, strengthen and improve the personal and interpersonal skills needed to defend psychological well–being, self-efficacy and environmental control in the working environment? and,
- ✓ Which training methodologies are most appropriate for developing the personal and interpersonal skills needed for being resilient?

Keywords: psychological resilience, organizational resilience, multi-style leadership, training methods, personal & interpersonal skills

1. Introduction

In the century of globalization, the new VUCA (Volatility, Uncertainty, Complexity and Ambiguity) environment, (Bennet-Lemoine, 2014) affects and influences the organizational environment of public administration and education in general and the Hellenic Public Administration and educational system in particular. In this context, Heads of units together with their employees are called to manage expectations of different stakeholders and different mentalities, work with systemic conflict, run effectively and at the same time transform their unit.

The human factor in the above-mentioned domains is decisive for any organizational change. As a result, traditional notions of leader supremacy over employees are being replaced by notions of leader-employee partnerships in which leaders are more like coaches and less like bosses. Thus, the Heads of units (junior or senior managers) have a new double role: on the one hand to do their job effectively and efficiently and on the other to support the team of their employees promoting collaboration, concern over employee needs and objectives, and provision of help and assistance. Taking into account, that, most probably, pandemics of this kind are likely to occur more frequently in the future, it will be interesting to search how it has affected the level of resilience in the afore-mentioned domains. As Jolli pointed out, "fighting this kind of disturbance is not just about building higher walls - it is about adapting the waves" (Jolli, 2012). The term resilient policy is not just about tackling the pandemic and its effects, it is more about managing a system in imbalance. Therefore, in correlation with the challenges of the new era of digital transformation (Komseli, 2020), the need to develop digital courses that can stimulate resilience skills, strengthening the psychological resilience, is considered crucial. The concept of resilience has been in the forefront of EU main research policies for the last decade and is being studied by scientists (Boin & al., 2013, Donoghue M., 2020, Weick E.K. & Sutcliffe M. K., 2007). At the same time, the relationship between the leadership models and their connection with the employees' resilience during their everyday practice is being a correlated fact (Franken E. & al., 2019, Fischer C., 2022, Flüter-Hoffmann et al., 2018).

Under these circumstances, effective administration and leadership goes beyond the limits and responsibilities of the one and only "leader" and hierarchical manager, who has the ability to control, either in a charismatic way or using expertise, in order to solve 'complex and rapidly changing' problems. There is a new type of leadership characterized by participatory, cooperative, empathic, team working characteristics and abilities, capable of creating a working environment that allows all civil servants to take responsibility and initiatives creating an environment of confidence, participation and inspiration. This leadership style requires engaging others in purposeful action that enables a mindful 'response' as opposed to a fearful 'reaction' (Bourbouli, 2019).

Training Programs which can stimulate resilient skills for learners and university curricula enriched and specialized in resilience techniques are considered necessary. They aim at recognizing, understanding, and learning specific personal and social skills in order to strengthen the cognitive and psychological resources of learners. Topics such as digital leadership, and leading hybrid teams, leading with digital tools, stimulating innovation and openness are very important and as Zeike et al. (2019) pointed out "The better digital skills the higher the well-being of digital leaders". At the same time, issues that improve the quality of relationships within organizations but also create a safe environment for employees seem to have a positive effect on performance and increase the resilience of both organizations and employees. So, issues such as building trust, strengthening teamwork –and virtual teamwork-, encouraging positive team interaction create trust (Larsen et al. 2020) and fairness among employees and cultivate psychological safety and error culture.

The aim of this paper is to explore issues that could enrich university curricula reinforcing resilience skills in organizations and individuals.

2. Psychological Resilience: Theoretical & bibliographic approach

The concept of psychological resilience comes from the area of psychology and it is a way of interpreting how people can manage life and their wellbeing despite adverse and complicated situations. This concept was originally intended for children and teenagers and was later extended to adulthood. Historically speaking, the development of resilience has been primarily defined in a number of ways; the first and most important one -key to psychological resilience in childhood- being based on reflective dialogue, in the sense of affirmation, recognition and respect of the child from individuals that it trusts (Linde-Leimer, Wenzel, 2014). Research in the field of psychological resilience looks for key factors that allow individuals to develop in a normal way, despite adverse life circumstances, involving a variety of factors such as:

- ✓ Individual factors
- ✓ The social context
- ✓ The quantity and quality of life events.

There are many ways to explain what resilience is. In the world of positive psychology, resilience is being able to recover and adapt quickly from a traumatic event or stressor. In other words, it's a kind of inner strength. Generally speaking, people consider others to be resilient when they, have a consistently positive outlook, deal with each difficult situation they face with ease and don't exhibit excessive negative emotions during difficult times. Resilience in the workplace can help people recover from challenging experiences. It can also assist their growth and development, experiencing change and growth at the same time

The term psychological resilience refers mainly to "a dynamic process that involves positive adaptation in the context of significant adversity" (Luthar et al., 2000). According to Flüter-Hoffmann, the "mother" of the concept is Emmy Werner (1929-2017) who conducted a longitudinal research in Kauai (1955-1999) which is considered the cornerstone of psychological resilience. According to Flüter-Hoffmann there are stressful factors that affect the resilience of individuals and these can be approached in two ways: the preventive approach, where protective factors are strengthened, like sources of resistance and sources of resilience and the therapeutic approach where stress management and resilience indicators are examined in order to deal with post-traumatic stress or depression. In this case, resilience for psychological health is considered as a factor for quality of life and well-being. If positivity is considered as the goal of a process both on an individual and collective level, mental resilience is an essential resource gained during this process (Galanakis, Mertika & Sergianni, 2011). To be sustainable means to be resilient.

In addition to psychological resilience there is also the concept of organizational resilience which is defined as "the ability of an organizational system to survive, adapt and develop in the face of unpredictable changes and even catastrophic events" (Resilient organizations, www.resorg.org.nz). For Greszta et al. (2021) "resilient organizations plan and invest on disruption in order to be able to adapt, endure and reorganize quickly the ways that allow them not only to do so successfully, but in a way that can lead them to a 'better normality'.

According to Salanova "the healthy and resilient organization (HERO) is an organization that makes systematic, planned and proactive efforts to improve the groups of employees in an organization as well as its processes" (Salanova M. et al., 2012). Organizational resilience is the ability of an organization to anticipate, prepare, respond and adapt to both gradual change as well as sudden disruptions in order to

survive and thrive. Resilient organizations prepare for difficult situations, show a generalized capacity for research and study, learning and action without knowing in advance exactly what to prepare for. Actually, they are organizations that steadily learn the process of change and adaptation. Given the evolving needs of organizations, growing resilience is a key strategic priority. People will perform better if they aren't just keeping their heads above water. Instead, opportunities for growth and self-learning that come with change will energize them. A head of unit with low workplace resilience is likely to crumble under pressure, having a negative impact on workplace culture and employee engagement. It may even further impact team performance. As a result, lack of personal resilience affects team resilience. On the other hand, Heads of unit with a high degree of psychological resilience will likely overcome such a challenge with ease. They'll shelter their team from pressures, bringing in further workplace training or procedural efforts to get their team closer to expectations.

During the last decade, the concept of resilience has been of utmost importance in the EU, which funded the project "Resilience-a key skill for education and job". The project lasted approximately two years (12/2012 – 11/2014) and focused on developing ways to strengthen psychological resilience. Psychological resilience is a subject of research and study from social psychologists as well as scientists who are involved in the design and implementation of public policies (Boin & al., 2013, Donoghue M., 2020, Weick E.K. & Sutcliffe M. K., 2007, Deloitte Canada, 2021, Graham J., 2021). At the same time, the study of the relationship between leadership models of public organizations with the resilience of employees is being developed (Franken E. & al., 2019, Fischer C., 2022, Flüter-Hoffmann et al., 2018).

Based on the literature and research on the topic, the capacity for resilience emerges as a common feature of complex systems, such as organizations, cities or ecosystems that constantly evolve through cycles of growth, accumulation, crisis and renewal, which quite often, have the ability to self-organize themselves through unexpected, innovative configurations. In order to achieve sustainability, important components such as innovation, insight, mindfulness and effective collaborations among governments, organizations and working groups seems to be necessary. In today's organizations, resilience has become a key human trait required for peak performance. It's an increasingly important characteristic for organizations to cultivate in employees. In their book "The Agility Factor," Williams, Worley, and Lawler (2014) highlight that organizational agility highly correlates with organizational resilience. Both factors determine the adaptive capacity of an organization and this adaptive capacity enables organizations to perceive and respond to changes quickly. Resilience also shapes the way employees respond to and manage the stress of change. Resilience is also associated with increased work engagement, job satisfaction, and organizational commitment. This is likely because people who are better able to bounce back from stress and adversity can apply those skills to the workplace. Rather than giving up due to the inevitable setbacks they encounter in the course of their work, they're able to carry on and focus on the big picture.

The challenges of the modern VUCA era and their impact on modern working environments have highlighted the need to develop psychological resilience of individuals. Adult education, a main project of the Institute of Training (INEP) of the National Centre for Public Administration and Local Government (EKDDA), focuses on the development of the adult learner's personality (Rogers, 1999) and is governed by a humanistic approach, placing the learner civil servant at its center (Kokkos, 2005). Based on this approach, the development of the psychological resilience of civil servants in the whole of public administration in Greece emerged as a learning need that should be covered following the corresponding educational activities of INEP.

Already from 2014, EKDDA, being the presiding Organization during the first half of 2014 (Greek presidency of the EU), distinguished the importance of resilience in order to face future challenges in the public administration. Thus, it set resilience as the central keynote theme of the meeting at DISPA (Directors of Institutes & Schools of Public Administration) under the title "Resilience as a challenge for the public sector: the Public Administration (PA) Schools' and Institutes' contribution". Following the above-mentioned demand, a training program in INEP for psychological resilience was designed and implemented entitled: "Improving social skills: Development of Psychological Resilience in the workplace (Psychological Resilience)".

3. **Training programs (TP) / modules appropriate for strengthening and improving personal and interpersonal skills needed. Case study: the Training Program of INEP**

    3.1 Case study: The Training Program of INEP entitled "Improving Social Skills: Developing Psychological Resilience in the Workplace": Objectives, thematic units & educational methodologies of INEP's TP

The TP lasts 35 hours and aims at the "identification, understanding, and being acquainted with specific personal and social skills, on the part of employees, in order to strengthen the cognitive and psychological resources that are necessary for the defense and promotion of psychological resilience". Regarding the expected learning outcomes, the team that designed the TP states that "the desired change is expected to in terms of Knowledge, skill and behaviour, affect the tripartite "thinking - feeling - behavior" and to facilitate the constructive response to challenges in modern work environments, through experiential personal development exercises". The learning objectives are:

*   cultivation of the necessary skills and tools to deal with the various psychological stressors and to strengthen self-sufficiency and adaptability through a "toolbox", which will allow trainees to effectively manage crises and stressful environments, to achieve creative and interactive solutions to problematic situations, returning at the same time to a state of "homeostasis", positively assimilating the stressful experiences, or even deriving new maturing meaning from them,
*   development of individual skills (self-coping skills), such as the ability to self-regulate negative as well as positive emotions, cognitive and behavioral flexibility, the ability to limit and regulate impulses, reducing avoidance of problems and encouraging constructive reaction, the ability to organize and set goals, to "create" meaning from life's experiences, but also to know how to approach networks and organizations that provide help and support,
*   cultivation of skills with a strong protective effect, such as the internal center of control and the consequent feeling of self-efficacy,
*   building and strengthening positive emotions,
*   cognitive reframing techniques,
*   hope and "learned optimism", but also resilience in the face of adversity (TP's documentation of feasibility, 2020).

The TP is based on experiential learning and communicative approach with little references to theoretical approaches and many practical applications, exercises, workshops, individual assignments etc. that are carried out throughout its duration. TP's target group is all civil servants and its main thematic topics are:

*   Psychological Resilience: the notion and its dimensions
*   Psychological Resilience and Change Management
*   Psychological Resilience and Crisis Management

- Psychological Resilience and Stress Management
- Development of Psychological Resilience Skills in individuals – Workshop
- Development of Psychological Resilience Skills in groups and teams – Workshop
- Development of Psychological Resilience Skills in organizations – Workshop
- Implementation of individual tools and methods in order to develop psychological resilience skills.

3.2 Research context, assessment tool and results

In this paper, we try to investigate whether the TP's participants assessed that the program helped them in the acquisition of resilience skills, i.e. if and to what extent the expected learning outcomes of the TP were achieved. The evaluation "constitutes a necessary condition regarding the planning, organization and implementation of an educational program" (Vergidis & Karalis, 2008). This means "the effort to investigate the extent to which the planning of an education process, but also the procedures followed and the choices made during its implementation are considered appropriate and successful" (Karalis & Papageorgiou, 2012). The study done was based on the participants' evaluation, the decoding of the trainees' suggestions/observations and the recording of the thoughts and feelings of the participants in a program in which one of the writers participated.

Regarding the context of the study, the data collected refers to the evaluation results of nine (9) TPs held in Athens in 2021, in which 207 trainees' civil servants participated. The Training Institute (INEP) in Athens was responsible for the organization and materialization of the TP; however the participants were from all regions of the country. The electronic evaluation questionnaire was completed by 176 people, showing that 85% of the participants completed the evaluation questionnaire. While the results presented here are indicative, they have been derived from data with a high percentage of ratings (85%) relative to the participants (high sample in relation to the population). Limitations of the study are: a. the data collection is based on the INEP evaluation questionnaire and b. the short duration of TPs implementation, so further monitoring of these evaluation indicators is required in the future as well as the data from the evaluation of the program (evaluation questionnaire) 3 months after participants' return to their working environment.

Regarding the ethics of the study, statistical data is available to INEP/EKDDA and is used only for the needs of this empirical part of the study, no personal data are used, nor is there any reference to the names and personal details of both the participants in the evaluations, as well as and to trainers evaluated by them.

The evaluation tool includes questions on six general indicators (GI), but for reasons of relevance to the conference, the findings from three general indicators are presented:

- General Indicator 2: TP's usefulness regarding personal & professional needs
- General Indicator 3: Trainers' evaluation
- General Indicator 4: TP's Educational components

As observed from the data study, the positive opinions, formulated on the basis of the eleven-point scale (from 0 to 10), approach values of the order of 9 (Excellent) for all the questions of the individual general indicators.

Figure 1, shows the utility of the TP in terms of meeting service needs and personal/scientific interests of the participants. As can be seen, the TP covered to a very large extent the professional needs as well as the personal/scientific interests of those who participated in the evaluation (91.6 % and 90.4% respectively) and this is highlighted as a particularly interesting element.
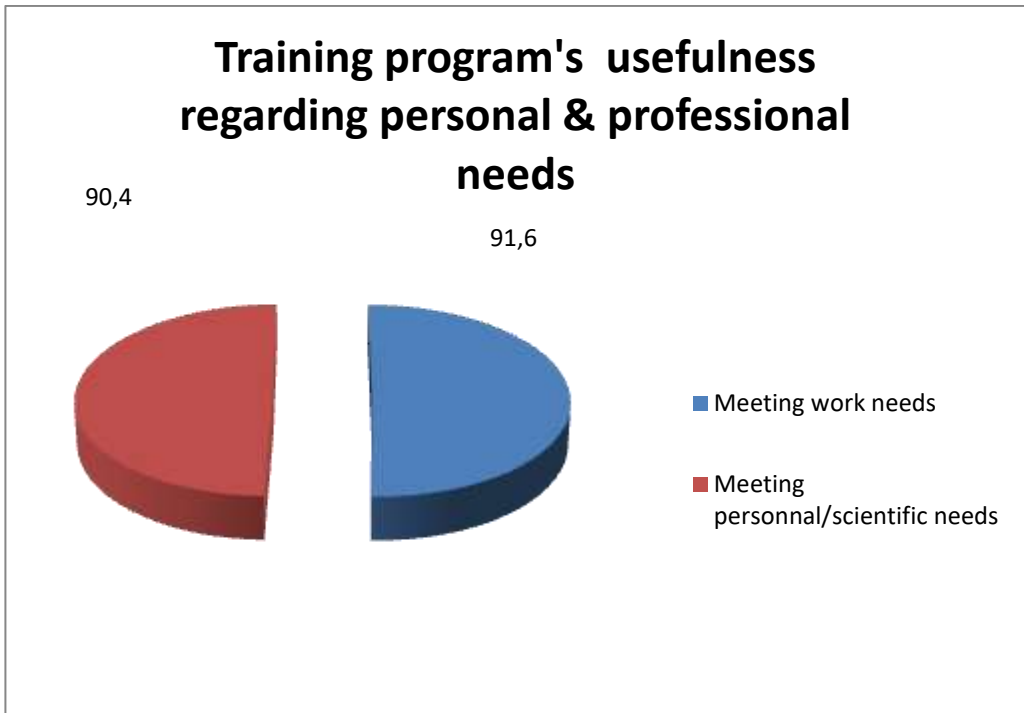
Figure 1: Training Program's usefulness regarding personal & professional needs

Figure 2, shows the evaluation for the trainers of the TPs, who as can be seen were evaluated very positively (9.06, Excellent) in the whole of GI 3.
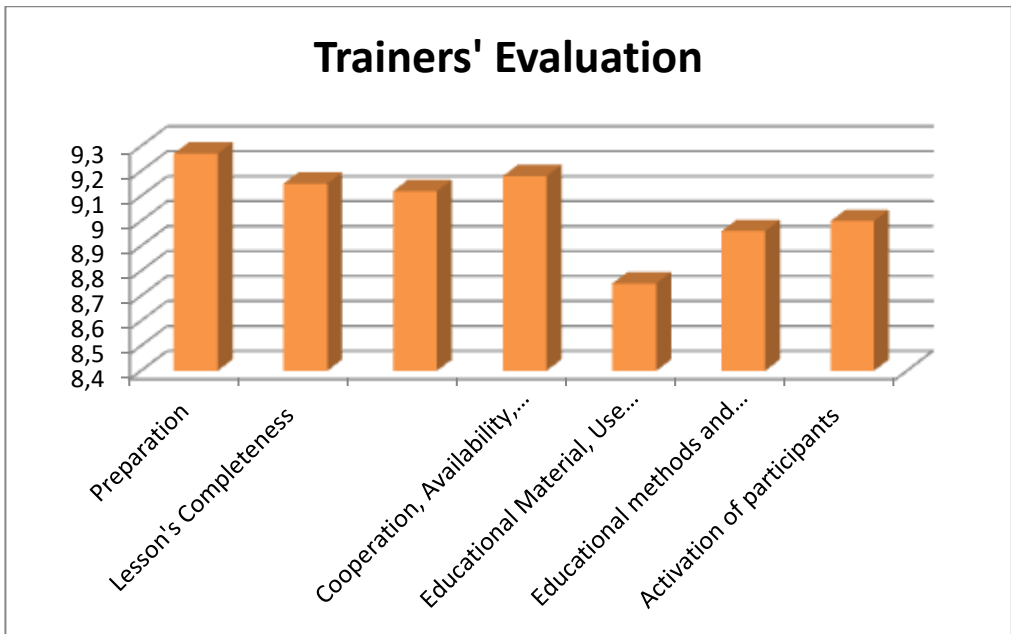

Figure 2: Trainers' Evaluation

In Figure 3, which concerns the evaluation of the educational components of the TPs, GI 4 was evaluated very positively as a whole (Average: 8.9). The figure also shows the evaluation by educational component with the lowest score observed in the evaluation of the educational material (7.74), an element that led to the development of educational material for this program in a later time.
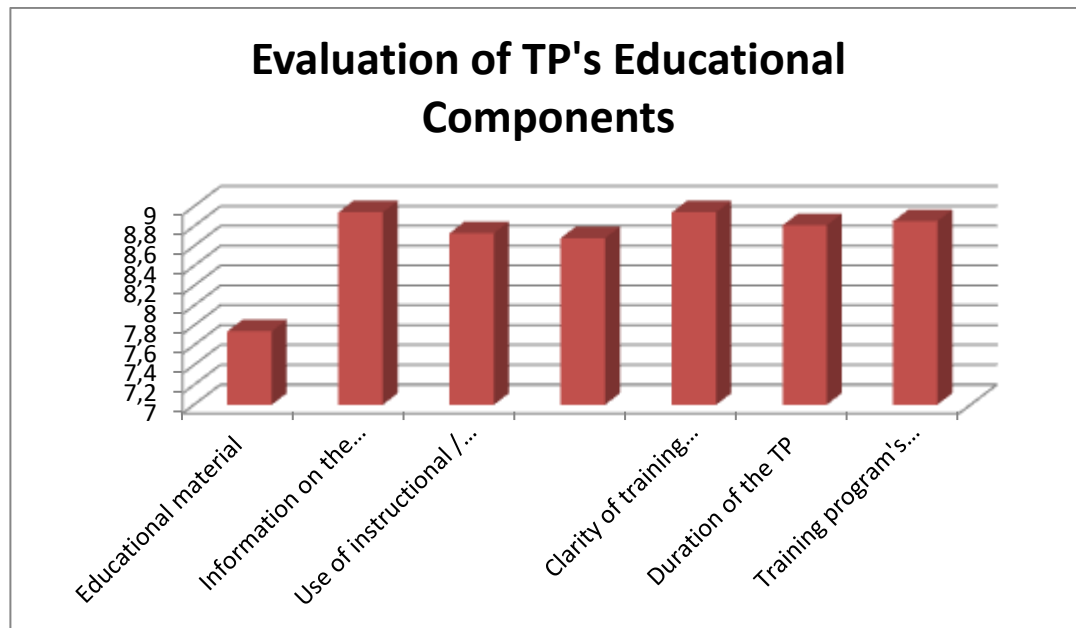
Figure 3: Evaluation of TP's Educational Components

Regarding the methodology developed, deviations were identified from the design of the TP, which, beyond the experiential and interactive nature of the TP, it provides potential for lifelong teaching in two phases, the first phase is a 4-day training (28 hours) and the second phase is a follow-up meeting after one month for one day (7 hours). During the meetings of the first phase of the program, the concept and dimensions of psychological resilience are developed mainly through exercises and individual tasks. On the 4th and 5th day of the program emphasis is given on developing the skill of psychological resilience through workshops.

However, in the implementation of the programs under study, some modifications were made regarding the educational methodology. Due to the pandemic of covid-19, the intended methodology was not followed and 9 programs of the total were conducted using the modern distance education method, through the webex platform. This element is recorded because it significantly differentiates the design in terms of educational methodology. From the evaluations and the personal participation of the writer, the experiential and interactive nature of the program does not seem to be negated; however the implementation of the 5th day immediately after the 4th day constitutes a basic modification, because the trainees work on their individual assignments without the basic component of the last day which is their presence in their workplace as a prerequisite of the TP's design.

The key to the success of such programs, according to research, is the directness with which the content of the program is taught. Immediacy enhances contact and communication between trainer and trainee, as in this way the trainer can understand the needs of the trainees making the training more effective. The most direct form is that of individual education. Then, they follow that of group training, the training of the trainer, while as less direct, as is natural, is the computer-based one (Kraiger, 2003 as cited by Vanhove et al., 2015).

From the case study of INEP TP, we can conclude that "Use of experiential / participatory, interactive techniques" as a component of the training program has been assessed very positively by the participants of the training programs (Figure 3). As far as it concerns methodologies used during this training program we mention that the whole training is based on workshops, personal exercises, and interactive, interpersonal communication.

4. Training methodologies for developing leaders & employees' psychological resilience

According to Silva (2009) "21st century skills is one of the most ubiquitous terms in today's education debates". They host a number of occupational skills, non-cognitive skills, interpersonal skills, life skills, and application skills, which presuppose that the most important is what they can practically 'do' with the knowledge the get during their studies for integrated individual, community, and socio-economic development. "Even if one considers outcome-based learning, skills such as independent thinking, problem-solving, decision-making, innovation – all of these skills are to be specifically and transparently integrated into curricula at all levels of education and training" (Panda, 2019).

The European Qualifications Framework (EQF), in the context of skills in training and higher education, distinguished specifically among knowledge (learning), skill (application for a task), and competence (use of integrated abilities for professional and personal developments). In this context, the European Commission (2016) listed three types of skills, i.e. cognitive skills (analytical, critical, creative, reflective), methodological skills (decision-making, time management, problem-solving) and social skills (team work, interpersonal communication, conflict resolution) which need to be developed within both Vocational Education & Training (VET) as well as Higher Education (HE).

Andrews and Higson (2008) identified the following soft skills meant for graduate employability; and these are considered as essential graduate learning outcomes:

- ✓ Professionalism,
- ✓ Reliability,
- ✓ Ability to cope with uncertainty,
- ✓ Ability to work under pressure,
- ✓ Ability to plan and think strategically,
- ✓ Ability to communicate and interact,
- ✓ Written and verbal communication skills,
- ✓ Information and communication technology (ICT) skills,
- ✓ Creativity and self-confidence,
- ✓ Self-management and time-management, and
- ✓ Willingness to learn and accept responsibility.

From this list the skill for Ability to cope with uncertainty presupposes psychological resilience. The researchers located the following skills emphasized by both graduates and employers alike: business-related knowledge, skills and competencies; work experience; work readiness; and graduate mobility. These skills may be considered in curriculum design for higher education and training. Furthermore, 'life skill development' is considered as an integral part of any progressive higher education system today. Post-fulfillment of basic psychological needs, specially designed life skills programs focus on experiencing positive psychological development and optimal psychological well-being (Hodge, et al, 2012). Therefore, life skill development should also form an integral part of HE including VET.

In the UK, the most influential reports within education and training have been the Dearing Report on Higher Education (Dearing, 1997) which recommended some most important core/generalizable/transferable skills for all types of education and training in higher and further education (for both general as well as vocational). Those skills were as much concerned with VET as to lifelong learning and effective "living" in the 21st century. The Curriculum Reform 2000, undertaken in the United Kingdom, led to nation-wide changes and transformations based on this report. The following four skills were specified:

- ✓ communication skills,
- ✓ numeracy,
- ✓ use of information technology, and
- ✓ learning 'how to learn'.

Here are some essential components of these transversal competences, those that despite their crucial importance do not normally form part of the set-up and practice in today's education. They include the actions that individuals in general and teachers-trainers, as professionals, are likely to engage in when they have developed such a set of attitudes, skills and knowledge. In this context, knowledge involves not only knowledge but also understanding; skills involve the capacity to implement and answer the cognitive, experiential and procedural issues at hand; attitudes are of evaluative nature and link to ethical, moral and psychological dimensions (moral values, ethics, motivation, and disposition).
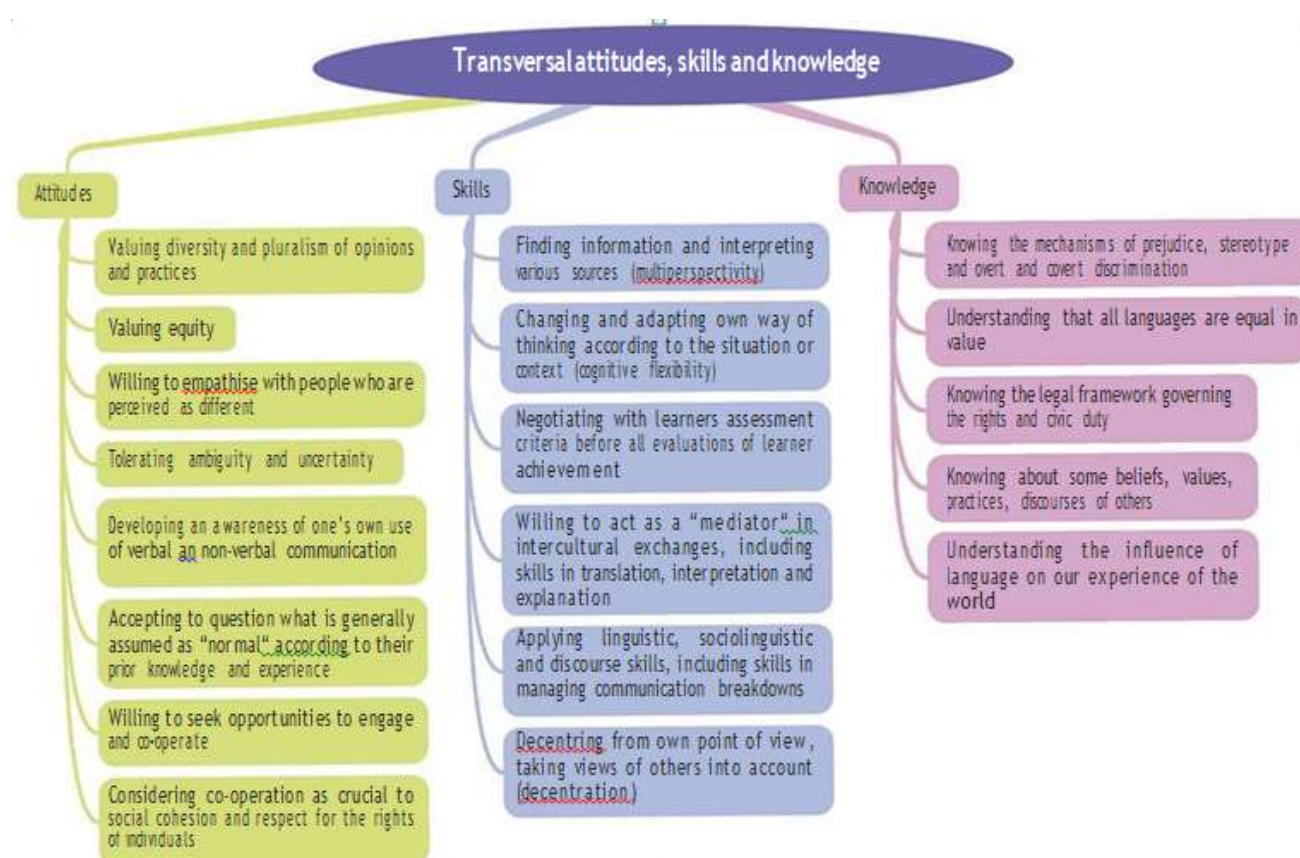
Figure 4: Education for Change, Change for Education, Teacher manifesto for the 21st century of the conference "The Professional Image and Ethos of Teachers", April 2014, Council of Europe, Strasbourg, p. 26
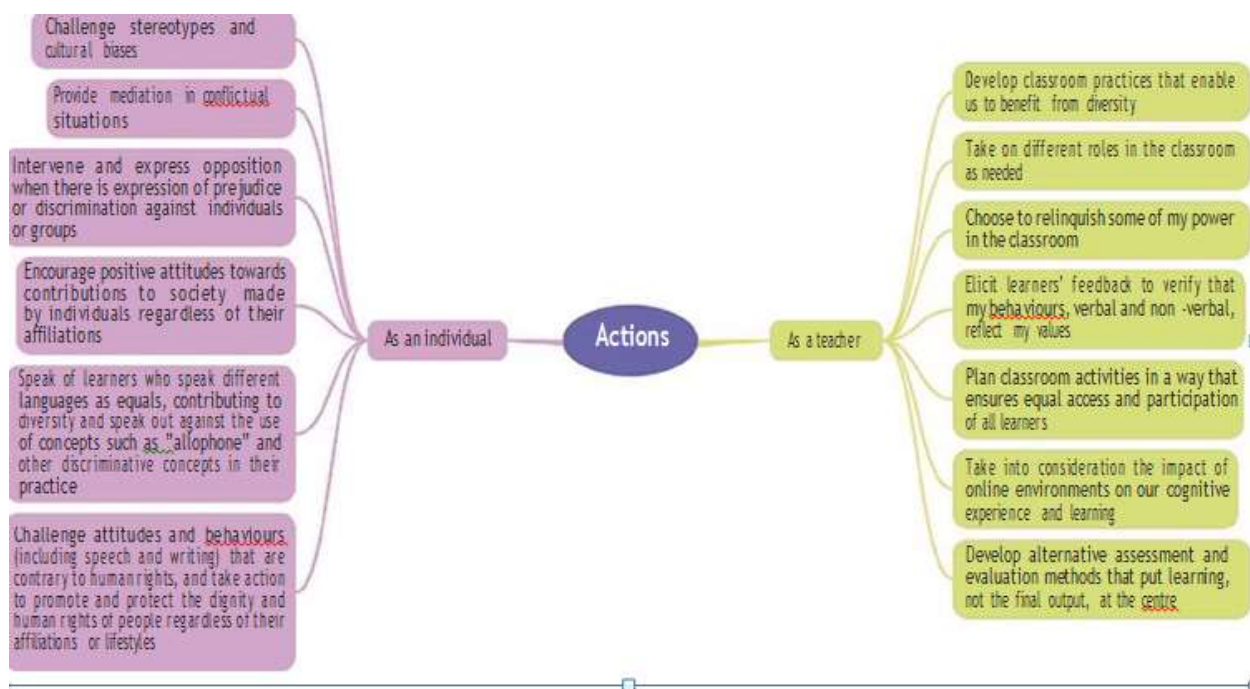
Figure 5: Education for Change, Change for Education, Teacher manifesto for the 21st century of the conference, "The Professional Image and Ethos of Teachers", April 2014, Council of Europe, Strasbourg, p. 27

From the research of Keevy M. (2020) among graduates of accounting expressing their views on the effectiveness of the delivery methods in developing soft skills, it is concluded that Case studies followed closely behind collaborative learning was considered as the most effective method in developing soft skills. These results encourage educators to rely less on lecturing and objective tests and introduce methods giving the opportunity to students to be actively participate in the learning process.

The majority of resilience building and training intervention programs take place in the work context in groups within classrooms (Bond & Bunce, 2000; Gardner et al., 2005 as cited by Vanhove et al., 2015). Strengthening the social network of individuals in the workplace can act as reinforcement. There are also different ways for conducting such trainings as individual training working trainers or coaches as well as training the trainers' programs. This is very important because heads of units are trained to strengthen their mental resilience, not only foe their wellbeing but also for transmitting the acquired knowledge and skills to the rest of the team members or their subordinates (Sherlock-Storey, Moss, & Timson, 2013; Sood, Prasad, Schroeder, & Varkey, 2011; Lester, Harms, Herian, Krasikova, & Beal, 2011 as cited by Vanhove et al., 2015). After the pandemic, the computer-based training, both synchronous and asynchronous, turned to be a very profitable and preferred alternative, since it offers self-directed education where the participant is in control of their own time. To preempt those who want to question it, research has shown that it is just as effective as the traditional face-to-face method (Abbott, Klein, Hamilton & Rosenthal, 2009; Sitzmann, Kraiger, Stewart & Wisher, 2006 as cited by Vanhove et al. syn., 2015).

There are no competences without visible actions and acquired skills, but also not any kind of action without competences and skills respectively. Competences can only be observed through performance: what we can do in a given context, as the above mentioned figures denoted. By transversal competences we refer to competences which are not subject specific and can be applied to a range of aspects: content of teaching, pedagogical method, group management, day-to-day relationships with learners as individuals and as a group, with colleagues, parents and other public actors and bodies.

Conclusions

Navigating through the challenges of a fast-paced culture requires skills and strategies that can be developed by all educational systems. Resilience is a key strategy that helps employees and academia tackle stress, a competitive job market, workplace conflicts, and address challenges on the job. (Goh J., Pfeffer J., Zenios S.A., 2015). In the face of present and future setbacks, we must cultivate a resilient mindset. The American Psychological Association's (2017) position claims that personal resilience is not an individual trait but something that can be nurtured intentionally in anyone through behaviors, thoughts, and actions. Everyone's path to survival leads to the awareness and responses to difficulties and failures, as well as the knowledge, beliefs, and attitudes that produce these thoughts. Resilience is associated with greater job satisfaction, work happiness, organizational commitment and employee engagement. Raising resilience contributes to improved self-esteem, sense of control over life events, sense of purpose in life and improved employee interpersonal relationships.

Taking into account the above-mentioned study, considering Resilience Training should be a necessary prerequisite. It should be mentioned that there are a lot of similarities between the TPs of INEP and those designed and implemented by the Lifelong Centers of the Greek universities (KEDIVIM), which refer to all adult learning. Employers and higher education are increasingly turning their attention to resiliency training because in a dynamic work environment, resiliency training elevates job performance and work engagement. The American Heart Association (2015) released a comprehensive report examining resilience training in the workplace. Innovative strategies to improve employee health and organizational performance are highlighted. When considering training and design, the report recommends including these components:

- Overcoming Interpersonal Challenges
- Managing Emotions
- Guarding Against Burnout
- Coping with Work Related Stress
- Improving Sleep Habits
- Remaining Calm
- Dealing with Difficult People
- Improving Communication Skills
- Taking on New Challenges
- Improving Physical Health

Therefore, to be able to create a Resilient Culture, it has to be an integral part of the many layers that Organizational culture has. This culture must follow the principles of empowerment, purpose, trust and accountability. Building or improving a resilient culture is strengthened by showing support for employees and a commitment to addressing resilience, promote an open and trusting management style and train head of units to understand the importance of supporting the mental wellbeing of their employees. Foe educators to "expect the unexpected" means robust planning than perfect planning, flexing all educational plans as needed.

A learner-centered strategic vision in all university and training programs' curricula focuses on creating a safe, welcoming and caring learning environments, where learners can grow and develop, feel respected and valued, and have their specific talents and needs recognized. Therefore, setting high expectations, motivating building a respectful and favorable academic climate, developing positive relationships among the

stakeholders, and, encouraging teaching methods and curricula which are perceived as stimulating and relevant promote and lead to developing a resilient culture.

Effective leaders promote resilient and collaborative cultures. The Centre for Confidence and Wellbeing (2006) claims that coaching skills are effective because they tend to be personalized to the individual. Coach-leaders are able to understand the whole person and help them develop skills in the context of their unique work situations. Coach-leaders also provide the needed support when doing the hard work of making changes. Teaching reframing techniques will help them see the new possibilities in a situation. With this new perspective, employees are better able to bounce back, grow, and move through the challenge.

Cooperation within education systems can take different forms – from networking to more formalized clustering of higher education institutes and institutes of the public administration. 'Networking' includes discussing ideas and sharing good practices on certain topics. National authorities can assist by encouraging and enabling this regional/local cooperation, while national and local education departments are also well placed to liaise with other government departments and services to ensure alignment of policies.

Teachers' and trainers' skills and competences, which can only be achieved through excellent teacher and trainer professionalization, are also vital for resilience. That is why teachers and trainers should not only be willing to deepen their professional judgment over time, but also to develop new skills and competences on an ongoing basis through continuous professional development (CPD). That is the only way to make learning more relevant and engaging. At the same time, teacher and trainer well-being may also be enhanced.

Creating and supporting multidisciplinary teams requires a strategic approach to resilience. Rather than each member of the team working separately to address their own priorities, this requires all to have a shared understanding of the outcomes they want to achieve for each learner, and to determine how they can bring their combined expertise together (Downes,2011). Working as part of a multi-agency team, professionals may also need to share their resources and create new information sharing agreements and shared budgets for some interventions.

Last but not least, relevant and stimulating curricula will assist teachers and trainers to create motivating lessons promoting resilience. Curricula should allow personalised forms of teaching and learning, to facilitate the acquisition of knowledge and development of skills and competencies to the best ability of each trainee, while preserving the quality of the curriculum content and high expectations. Curricula at each stage should be aligned with subsequent levels of education and training or alternative training pathways according to the European Toolkit for Schools. Curricula should allow a variety of teaching methods, including collaborative teaching and learning, on-the-job learning and coaching, which have proven to be beneficial in (re-) engaging and motivating learners and keeping them in education and training. These teaching methods should maintain high quality standards for all learners.

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