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Communication Technologies in Education:

Proceedings of ICICTE 2021

Editor
Litsa Varonis

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Editor
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Communication Technologies in Education: Proceedings of ICICTE 2021

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Preface to the 2021 Proceedings

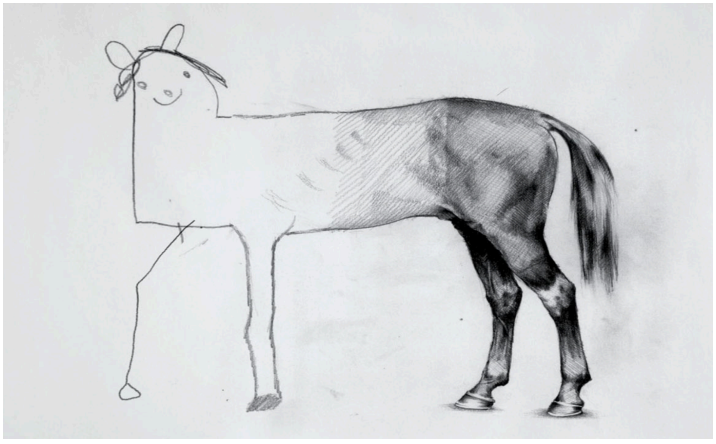
WE'RE STILL IN A PARALLEL UNIVERSE! AND IT IS OUR NEW REALITY

Evangeline (Litsa) Marlos Varonis
Editor, ICICTE 2021 Proceedings

The title of the editor's preface to the ICICTE 2020 proceedings is "ICT Professionals as Essential Workers in the Parallel Universe of Pandemic 2020: Panic > Partner > Pivot > Prevail" (Varonis, 2020). Many papers in these 2021 proceedings explicitly comment on the aftermath to the quick pivot to online and remote learning, including the need for improved infrastructure, robust technology, professional development, creative thinking on the part of instructors and learners, and maintaining social presence. Faculty who might never have used a Learning Management System before might have been pushed into the deep end, and this emergency measure worked most effectively when both technology and training resources were available for support. Similarly, students experienced sudden transitions, and probably had an easier time of it if their instructors were comfortable with the change and if their institutions provided help with the infrastructure.

Figure 1

"The Horse" – Meme that Represents when the Beginning is More Polished than the End



A meme of a horse created for an ad campaign (Bati, n.d.) has become a wonderful metaphor for when the beginning is more polished than the end (Figure 1). We

panicked, we partnered, we pivoted, and in most situations, through perseverance and good intentions, we prevailed, creating a horse with four legs that could carry us, even if the legs were not equally sturdy.

We're better prepared now: institutions have had a chance to address infrastructure and technology weaknesses, and instructors have had a chance to prepare for delivery that might be face-to-face, or online, or remote, or any combination of the three. It's time to add another "P" to the list, related to evaluation, and that is: "Ponder". We need to reflect on what's happened, on what we've done, on where we need to go, on how we can improve going forward. To do this, we need to evaluate. The project isn't over until you assess it. In the very first ICICTE 2021 workshop on Thursday morning, Conference Director Nancy Pyrini talked about the fact that she wanted our feedback after our visits to the FAnTASIA project site. What did we discover? We couldn't download it on an iOS platform and we couldn't download it in the United States. Feedback like that is critical and helps us move past the "reactive" state of our response to the pandemic and become pro-active by integrating best practices based on solid research and practice. The contributors to ICICTE 2021 offer a wealth of such research and practice.

Welcome to our new, robust reality, where ICT has provided excellent solutions to the problems thrust upon us by the pandemic. Now, we need a new meme, one that represents a polished beginning, perhaps a sagging middle, and a polished and powerful end.

Bati, Ali. (n.d.). *The Horse*. Ali Bati. http://www.alibati.com/horse

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CULTIVATING ENTREPRENEURIAL MINDSETS AND DIGITAL SKILLS IN PRIMARY EDUCATION: THE DIGITALIS PROJECT

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Abstract

The current paper presents the DIGITALIS project that has the vision to promote the cultivation of digital skills and entrepreneurial mindsets from a young age, focusing on primary education students. The project responds to the need for shaping the future generations of people who can think outside the box, which is the key to the innovative solution to many global problems and challenges. Targeting the cultivation of entrepreneurial mindsets and digital skills, the DIGITALIS project adopts innovative teaching and learning methodologies and technology-based training approaches. The proposed methodology will be a three-fold model combining classroom teaching and learning strategies, a serious game, and outside-of-the-classroom business experiences. The project addresses equally the two main target groups of every educational system, namely, students and teachers. Through the projects' methodological framework, primary education students will enhance key competences including creativity, innovation, teamwork, collaboration, problem-solving, and critical thinking. Additionally, DIGITALIS aims to actively involve teachers during the project's activities, aiming to empower their digital skills and equip them with modern and alternative technology-based tools that can support them in providing students with more engaging and motivating learning experiences, while achieving specific learning outcomes.

Introduction

The coronavirus pandemic situation (COVID-19) impacted education and affected all students regardless of the level of education, nationality, income, or gender. COVID-19 overcame national borders and highlighted the lack of digital skills and the urgent need for the digital transformation and modernization of educational systems globally. Global educational institutions' lockdowns affected the regular delivery of education, leading to online education and virtual schooling that posed new challenges to educators and students while highlighting the lack of digital skills. This crisis resulted in tremendous learning losses for all levels of education that could extend beyond this generation, while could result in high percentages of dropout rates in the following years. The current COVID-19 crisis and its impact on education are far from over and the possibility of future unknown crises makes

the need for reflection on the way educational systems work more imperative than ever. There is an urgent need for a quick response supporting the modernization and digital transformation of education.

Equally important is that this situation revealed that innovation, smart ideas, adaptability, and responsiveness include skills that are necessary to survive at personal and workplace levels. In a constantly changing global society and workplace, the skills needed for a sustainable and prosperous future go beyond numeracy and literacy. Creativity, innovation, teamwork, collaboration, problem-solving, and critical thinking are key competences of the 21st century that can foster employability, socio-educational, personal, and professional development (Binkley et al., 2021; Van Laar et al., 2017; Voogt & Roblin, 2012). Moreover, these skills have been identified as strategic for the smart economic and social development of every nation-state. Additionally, due to the rapid technological advancements that are becoming more and more embedded in our everyday lives, there is a need to cultivate digital skills and thinking outside the box for young people. Both of the abovementioned set of skills (digital and entrepreneurial) should be addressed from an early age and primary education should go a step further and incorporate innovative teaching and learning practices.

In this context, the DIGITALIS project aims to address these sets of skills by using technology-based approaches and pedagogies that address the needs of primary education. Specifically, a novel serious game will be developed aiming to empower key skills for young students, who will become the next generation of innovators in tomorrow's digital era. The aim and challenge of the project are not just to adapt the training provided to the digital era and connect it with new technologies, but to build a holistic approach to promote gradual professional development as learners progress in the educational system starting from the primary level. It is highly important to enhance digitally young people and future workers, through training that meets the needs of the labour market and at the same time encourages the development of the sense of initiative and innovation that could be the key to unemployment solutions in the future. The proposed serious game will be a novel tool for unique, motivating, and engaging teaching, learning, and training experiences for primary education students that will act as a driver for change towards the integration of technology-based approaches from primary educators to enhance life-skills, digital skills, and entrepreneurial mindsets.

Additionally, the DIGITALIS project aims to empower teachers' digital skills and equip them with innovative digital tools for implementing novel practices in today's digital classrooms. Teachers lack confidence in using technology in the classroom

although they acknowledge that technology can provide highly motivating and engaging experiences for the students (Finger et al., 2010; Organisation for Economic Co-operation and Development [OECD], 2019; Winter et al., 2021). Hence, primary education teachers constitute a critical target group for the DIGITALIS project, they will actively be involved, co-designing with the Partnership the digital tools to be used and transfer the knowledge gained to primary education students.

The Significance of Cultivating Entrepreneurial Mindsets at a Young Age

Lately, the cultivation of entrepreneurial mindsets has become a significant objective within the European Agenda. The Commission of the European Communities highlighted the importance of entrepreneurship education in its "Green Paper: Entrepreneurship in Europe" (2003), while the sense of initiative and entrepreneurship are considered to be among the most important competences for future generations. According to the European Education and Culture Executive Agency Eurydice report (2017), entrepreneurial education and culture is the key to shape future generations of innovators, by providing young people the necessary skills and knowledge that will lead to business innovation. People are not born entrepreneurs, but they become successful entrepreneurs by empowering their knowledge, skills, and entrepreneurial culture. Despite the significant value of entrepreneurial education, the Eurydice report states low levels of practical entrepreneurial learning at school. The DIGITALIS project aims to close this gap and proposes a novel pedagogical framework that aims to connect primary education and the business world. The project's activities aim to bridge the gap and disconnection between primary education and the business sector, providing teachers with the necessary guidelines.

The project will provide to the students core practical activities that will promote the establishment of strong communication channels between primary education settings and businesses, inspiring the students to think innovatively and outside the box. Equally important, is that this activity has the objective to familiarize primary students with the terms of entrepreneurship and green businesses and jobs while enhancing skills like critical thinking, innovation, and out-of-the-box thinking. This will be achieved through experiential entrepreneurship learning, based on bringing primary education students in touch with successful entrepreneurs, who could act as role models, inspiring the students and improving their attitudes towards entrepreneurship. The novelty of the proposed activities lies in the active involvement of entrepreneurs, who will visit online classrooms, providing the students the opportunity to experience several success stories, pose questions, and discuss their ideas, while the entrepreneurs will help the students look at the world from a

different perspective, explore new ideas and possibilities, look beyond the obvious, and think out-of-the-box. Through this highly interactive activity, the students will encounter real-life conditions and experiences, helping them actively conquer knowledge, understand the role of business, and connect the business sector with sustainable development goals.

Digital Education in Cyprus

COVID-19 created an unprecedented situation and forced countries to declare a state of emergency, resulting in closing schools globally. Teachers and students came face to face with new challenges as the delivery of education became digital. This situation revealed several problems and deficiencies in digital skills and equipment in Cyprus. The proportion of Cypriot schools with a high provision of digital equipment (laptops, desktop computers, cameras, whiteboards) per number of students and a high broadband speed is lower than the EU average at both primary and secondary levels (European Commission, 2019). The Cypriot Primary Education emphasizes utilizing modern technological achievements and integration of ICT in the curricula of Primary schools. The modernization and digital transformation of primary education focus on three main pillars:

- The development of modern and ICT-based material and technical infrastructure in all classrooms of schools;
- The continuous training of teachers in the use of ICT-based teaching and learning approaches;
- The modernization of the curricula.

Efforts are made towards all three pillars, yet digital education is among the greatest challenges that the Cypriot educational system faces in primary and secondary education (European Commission, 2019). Even though Cyprus invests in technological equipment and teachers feel confident and well prepared to deliver technology-based teaching (Kyriakidou et al., 2000), there is a gap in digital skills. Several initiatives have been supported by the Ministry of Education regarding the introduction of ICT in Cypriot education, including the introduction of ICT lessons and robotics in selected schools and the donation of 250 tablets to primary and secondary education students. The course Design and Technology - Digital Technologies is recommended to be taught at the last two classes of primary education and the purpose of the course is to enable the involvement of students in a creative and innovative process through which they will acquire the necessary knowledge, skills, and attitudes to meet different needs and to solve various problems of the human environment. The course also provides students with opportunities to develop skills and attitudes that are necessary for the modern society of the 21st century.

Furthermore, to boost the integration of ICT in primary education, some educational software and tools have been purchased including Kidspiration, Kar2ouche-Creative Writing, Gennadios Encyclopedia, Journey to Culture, About Cyprus, Virtual Labs Electricity, Virtual Labs Light, Focus on Climate Change, Sibelius, Arc View, etc.

The implementation of ICT-based teaching and learning is a major challenge in Cyprus and future actions should be planned to fill in the gap in digital education. Supporting teachers and enhancing their digital skills and competences and their confidence in using technology-based tools in the classroom could be the first step towards this approach. Moreover, it is essential to implement ICT lessons in all primary education schools, starting from a young age to familiarize the students with the fundamentals of computing. In this context, the DIGITALIS project aims to promote the development of key competences via a digitally based framework and through game-based learning approaches, supporting teachers in the integration of technology-based approaches in today's dynamic and digital classrooms.

The DIGITALIS Project

The DIGITALIS project has the vision to promote the cultivation of digital skills and entrepreneurial mindsets from a young age, focusing on primary education students. By providing a novel pedagogical and methodological framework empowered with new and innovative technology-based approaches and particularly serious gaming, the project will address the cultivation of key 21st-century competences including creativity, innovation, teamwork, collaboration, problem-solving, and critical thinking for young students. DIGITALIS project aims, via using a combination of in-class assignments and a game-based learning tool, to provide young students, aged 8-12 years old, a unique learning experience that will form the basis for outside-of-the-box thinking that can result in future innovative initiatives. Addressing the cultivation of entrepreneurial mindsets from a young age is also considered to be critical to economic growth. Now more than ever there is a need for creative people that can boost the global economy with creative ideas and initiatives. After all, the global pandemic situation constrains the business world to shift to digital to ensure its survival.

Equally important for the DIGITALIS project is the empowerment of teachers' digital skills. Teachers are the key actors of every educational system, shaping the future generations of citizens. School closure due to COVID-19 forced them to go online, posing a great challenge for those with low digital skills that must support hundreds of students. Moreover, the possibility of a future pandemic outbreak that could lead once more to possible lockdown measures highlights the significance of

addressing the lack of digital skills of teachers. In this context, the project aims to enhance teacher's digital skills and also equip them with new innovative and digital teaching methods and tools to support digital native students and dynamic, diverse, and digital classrooms.

The DIGITALIS project is dedicated to primary education starting from the preparation of young students for the world of work, where digital literacy is essential. The innovation of the project stems from the learning methodology that will combine in-class assignments with game-based learning techniques aiming to foster the development of a range of digital competences and also the cultivation of entrepreneurial mindsets. Combining theoretical and practical training will allow the students to connect theory and practice and conquer knowledge. The methodological framework of the project will offer both teachers and students high-quality training and will be implemented in five different European countries: Greece, Cyprus, France, Romania, and Spain.

The Aims of the Project

Primary education is the first step on an educational journey towards the acquisition of knowledge and skills that can guarantee a sustainable future for today's students. According to The European Commission's European Digital Progress Report of 2017, 90% of all today's jobs require at least some level of digital skills, while in the *White Paper on the Future of Europe* (2017), the European Commission highlighted that today's primary school students will more likely end up working in new job types that do not yet exist. In addition, European Education and Culture Executive Agency, Eurydice's report "Digital Education at School in Europe" (2019) indicates that digital competences are not explicitly addressed in the national curriculum by the Member States, particularly for primary education. Moreover, in several Member States, digital competences are addressed as a separate subject and not as a cross-curricular theme.

In the face of an increasingly uncertain, complex, and changing world that is facing challenges without precedent, there is a need for people not only to be equipped with digital skills but also to raise children who can think out-of-the-box, innovate, turn ideas into action, and be able to adapt easily to changes. Consequently, it is vital to start cultivating a sense of initiative and entrepreneurial mindset, from a young age, as children are born imaginative, energetic, and willing to take risks. Moreover, it is essential to cultivate an entrepreneurial mindset as it can promote competitiveness, innovation, and creativity. Early cultivating of such a mindset is considered to be critical to economic growth and prosperity as not only it will contribute to new innovative business ideas but at the same time, it will contribute to a

generation of people that will be competitive, solve challenging problems, think critically, turn ideas into action, and adapt to any change. However, despite the benefits of cultivating entrepreneurial skills, over half of the EU member states are in the initial stages of embedding it into their national educational systems and have few or no guidelines of entrepreneurial learning, while there is no instruction for the teaching staff for this thematic area.

In the light of the above challenges, the DIGITALIS project has as a main objective to empower the acquisition of digital skills and the cultivation of thinking-out-of-the-box mindset to the target group of primary education students aged 8-12. At the same time, the project aims to equip teachers with innovative technology-based tools and knowledge that can be taught in the classroom and support the acquisition of key competences including digital skills and entrepreneurial mindsets between the students. DIGITALIS project has the vision to develop from scratch and implement a novel serious game as part of the training methodology, to give the students-players real agency over the challenges and learning objective they're trying to master. The game will present real-life challenges that need to be solved through understanding and experimentation within a safe environment. These challenges will be novel to the students, offering access to experiences that would otherwise be impossible to accomplish in the classroom. The serious game will provide primary education students with a unique and highly motivating and engaging training experience that will boost the cultivation of core competences. The scenarios of the serious game will reflect real-life problems and challenges, promoting the development of a range of competences, including innovation, creativity, critical thinking, problem-solving, teamwork, and digital skills.

The impact of the DIGITALIS project is of paramount importance for both students and teachers. For the students, the vision of the project is to promote the personal and professional development of core life competences and skills along with the cultivation of entrepreneurial mindsets. For the teachers, the importance of the project lies in equipping them with new teaching and learning methodological framework enhanced with an innovative serious game designed to further support their efforts to equip young students with key competences.

The Target Audience

The DIGITALIS project targets two main categories:

- Students aged 8 to 12 years old. Through the dedicated project activities, this target group will acquire core digital competences and skills through the use of innovative teaching and learning methods and game-based

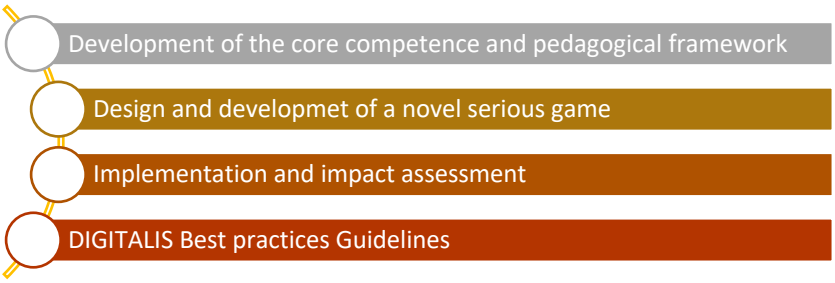
training tools. These skills are the starting point for a successful professional career and the best protection against unemployment and poverty. The students involved in the project are expected to acquire key life skills, including creativity, innovation, teamwork, collaboration, problem-solving, critical thinking, decision making. Additionally, the students are expected to cultivate entrepreneurial mindsets, a sense of initiative, and out-of-the-box creating thinking that could lead to future innovative business and professional attitudes.

- Primary education teachers. Teachers are the key wheel for achieving the digital transformation and modernization of education. Additionally, they need digital skills empowerment to respond to the needs of digital native students. Through the projects' activities, primary education teachers will be equipped with modern and innovative tools and good practices to be integrated into the curriculum. The teachers that will be trained through the project's activities will act as ambassadors and will implement the methodology and tools of the project in their classroom. In the long run, their active participation aims to foster future initiatives using the methodological framework and tools of the project ensuring also its sustainability.

The Methodological Framework

The main activities of the DIGITALIS project are presented in Figure 1.

Figure 1
Main activities of the DIGITALIS project



The project activities begin with the development of the core competence and pedagogical framework dedicated to primary education students aged 8-12. An analysis of the existing competence models and collaboration with teachers will lead to the identification of the key competence and basic skills model that will be in line with the age of primary education students. The identification of the competence model will contribute to the development of the pedagogical framework and the

training methodology to be used that combines in-class activities, enriched with experiential learning strategies (serious gaming) and online visits from entrepreneurs. The identification of the competence and pedagogical framework will lead to the development of a dedicated serious game promoting game-based learning experiences to primary education students. The in-class activities along with the serious game to be implemented will be assessed and evaluated providing significant feedback about the impact of projects' activities on students and teachers. The final activity of the project deals with the development of the best practices guidelines of the DIGITALIS Project, which will summarize the experience gained throughout the project, the methodology and guidelines along with the training resources and tools developed and implemented.

Conclusions

The main aim of the DIGITALIS project is to promote the cultivation of entrepreneurial mindsets and empower digital skills for primary education students. Equally important is that the project targets also teachers, aiming to provide them with novel technology-based tools that can be used in teaching and learning. The DIGITALIS project addresses today's urgent need for the digital transformation and modernization of education and has the vision to provide innovative digital tools for both the students and the teachers that can foster the cultivation of life skills that are essential for achieving excellence in the workplace.

The proposed methodology will be a three-fold model, combining classroom teaching and learning strategies, a serious game that will be developed, and outside-of-the-classroom business experiences. The classroom activities, which will be designed with the active participation of teachers, will empower students' core competences and entrepreneurial mindsets through real-life challenges. The classroom activities will be enhanced with the novel serious game providing students the opportunity to work towards goals, choose actions, and experience the consequences of those actions along the way. Moreover, the cultivation of entrepreneurial mindsets will be promoted through the establishment of strong collaboration channels with the business sector, through actions such as online visits to schools by entrepreneurs who are willing to share their experiences to help students cultivate innovative and out-of-the-box thinking. The DIGITALIS project proposes a novel key competency training framework incorporated with game-based approaches that will be implemented in five different countries (Greece, Cyprus, France, Spain, Romania).

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POINTING OUT TRENDS IN THE USE OF ICT IN SCIENCE TEACHING WITH THE HELP OF PUBLISHED ARTICLES

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Abstract

This paper aims to point out trends regarding the use of Information and Communication Technologies in science teaching. In doing so, it examines the topics of articles published in issues of refereed journals. These articles were published over the last decade. The paper attempts to provide insights into the topics that interest the researchers. The research on this topic is rather limited. With the help of descriptive statistics, it was concluded that considerable interest in this topic exists, and such interest is equally distributed among subtopics.

Introduction

Over the last decades, there has existed a significant interest in the use of Information and Communication Technologies in teaching. This applies to teaching as a process in general and specifically, in regard to certain subjects such as science. In the case of the latter, it is necessary to point out the main axes and the goals that learners are expected to fulfil by studying the subject, as these are defined by theory, literature and curricula. Thus, it is possible to appropriately plan how ICT can be used for the learners' benefits. However, this is not so simple because an ongoing debate exists regarding what should be taught in science classes. There also exists a debate about how and why ICT can be used. Despite that, there are some commonly accepted ideas on this subject. Teaching includes various tasks and activities. It is achieved by implementing appropriate practices, which rely on gathering, processing and analysing data and information. It involves presenting and communicating information and ideas in different cases. Any kind of teaching, irrespective of whatever goals it might have, is normally based on such practices and activities. This happens in most subjects, including science. Since ICT facilitates the flow and exchange of information, it can contribute to the teaching process. The main focus is to identify what functions of ICT can be used to assist the tasks included in science teaching (McFarlane & Sakellariou, 2002; Salihi, 2015; Fokides & Atsikpasi, 2016).

This paper aims to precisely identify the aspects of ICT that researchers consider worth studying for the improvement of science teaching. It starts with a discussion of the basic theoretical points regarding the use of ICT in science education and the modes through which they are implemented (Salihi, 2015). This is followed by an analysis of the process of selecting the research topic, which reflects the trends that researchers follow. Afterwards, the paper outlines the rationale behind the research, the research questions and the appropriate justification for the methodology adopted. Then, findings are presented so that finally conclusions can be drawn.

Literature review

The theoretical points of this study relate the theory about the use of ICT in science education in general. It is necessary to emphasise its dimensions, which served as subtopics. Since the trends examined were identified from the study of published articles, it is important to focus on the theory about selecting a research topic.

ICT in Science Education

According to McFarlane & Sakellariou (2002), the contribution and integration of ICT in science education can be achieved with the help of two perspectives. The first has to do with using ICT in current approaches to learning science. In other words, it is about identifying how teachers and learners can benefit from ICT within a usual, contemporary and mainstream science session. The second concerns the use of ICT as a means to bring in a shift in science teaching. In other words, it is about identifying how to fundamentally change the way science is taught and establish new modes of science teaching that are based on ICT. This classification can be explored further. The former focuses on the nature of science, which defines what should be taught in the science classes in schools, how it should be taught and why. The second focuses on the nature and mission of ICT and how it can or should influence people's lives, functions and, consequently, education. Both of these approaches can share certain common grounds since any development in teaching or science is interrelated with advancements in technologies, communication patterns and information flow (McFarlane & Sakellariou, 2002).

Salihi (2015) summarised the basic advantages of the use of ICT in science teaching, which have been identified in the previous projects of researchers such as Newton and Rogers (2001), Osborne and Hennessy (2003) and Derby and Campbell (2005). First, ICT can help the session become more active, constructive and self-regulated. Second, ICT can increase the interest and motivation of learners to participate in the learning tasks. Third, due to ICT, learners and teachers can have access to information recourses that are relevant, up-to-date, reliable and of high quality. Fourth, through a variety of presentation applications, it can help the

learners remain focused on the tasks and understand the basic points about them even when they relate to sensitive topics. Fifth, they can help learners understand complex and abstract ideas with the help of visualisation and digital modelling. Sixth, they can help learners develop inquiry and experimentation skills by providing opportunities for experiments and trial-and-error tasks with immediate feedback. Seventh, they can help learners further develop their digital skills for inquiry and learning purposes. Eighth, it can increase learners' creativity skills, as with the help of ICT, they can design and produce work and projects either to define concepts or present ideas. Finally, it can help sessions include data, phenomena and experience that happen outside the classroom, which would otherwise be a difficult process.

Subtopics on the use of ICT in science teaching

Bearing in mind the theory about the use of ICT in science sessions, Salihi (2015) pointed out five modes through which this theory can be implemented.
The first mode has to do with using ICT as a tool. This means using applications such as text editors, photo processing, databases, spreadsheets, multimedia, email or websites. Each of these applications may assist as a means of presentation, discussion, intercourse and assessment. They can also be used for preparing the teaching material.

The second mode is known in research and literature as 'computer-assisted learning'. This approach includes continuous interaction between the computer and the learner in an effort to construct and conceive new knowledge. In this mode, the learner plays an active role in the session, whereas the role of the teacher is gradually reduced. Learners are expected to use it in many phases throughout the session and not only occasionally (Denby & Campbell, 2005; Salihi, 2015).

The third mode is known as 'computer-assisted inquiry'. Sessions that follow this mode include activities where learners are expected to use ICT to collect information in order to come up with a conclusion, an explanation or a specialised scientific finding. In science sessions, this begins with a question that they need to negotiate or answer. In doing so, they use ICT to collect, manage and analyse data as well as engage in discourse so that they can come up with the desired answer and justify it.

The fourth mode pertains to the implementation of ICT in distance learning. Although distance learning was conceived and attempted before the advancement of modern technologies, ICT has certainly influenced it drastically by providing new approaches for communication and information exchange. In science lessons,

learners can cooperate with other learners from different regions while working on the same or similar projects. Lastly, they can keep in touch with organisations that specialise in issues related to science, such as natural history museums, observatories, laboratories (Newton & Rogers, 2001; Salihi, 2015).

The fifth mode concerns the integration of ICT into science teaching. This mostly differs from the previous modes since a session following this paradigm usually has preplanned goals that emphasise science and ICT equally. This approach is considered by theorists to be effective because it can help learners adopt a more realistic approach to several issues, as they deal with them in everyday life. A popular integration of science and technology is STEAM, which is a cross-curricular approach involving science, technology, engineering, arts and mathematics.

In short, ICT can be linked with science in five different ways: as a tool for learning; through computer-assisted learning; through computer-assisted inquiry; through distance learning; in integrated teaching. These are not treated only as teaching approaches. They also reflect the interest of researchers in the use of ICT in science teaching. In other words, they can also be considered as categories or subtopics of a major topic – how to use ICT in science classes (Newton & Rogers, 2001; Osborne & Hennessy, 2003; Derby & Campbell, 2005; Salihi, 2015).

All these trends have been apparent in literature and theory over the last decade. Theorists such as Roy (2021), Adov and Maeots (2021) and Deepshikha and Mohapatra (2021) identified the development of research and theory in all of the five subtopics. No subtopic seems to be missing from their findings and theoretical points. The use of ICT as tools was observed throughout the literature review (Fokides, 2021). Computer-assisted learning and inquiry have been well promoted along with distance education and integration (Salihi, 2015; Roy, 2021). It would, therefore, be reasonable to expect an adequate number of research articles that deal with the relevant themes. As no specific area is stressed more in the literature, it can be stated as a hypothesis that the number of articles that correspond to the subtopics is similar.

Selecting research focus

The selection of the research topic is a complicated task. Ideally, the researcher or the research group should identify the topic in the beginning prior to planning their study. In reality, however, this is not always so simple. The selection relies on various factors such as how familiar the researchers are with the topic. This familiarisation is also complex. It may be related to how frequently the researchers deal with a topic in their everyday life or at work.

For example, if researchers use ICT in science teaching, they will be tempted to conduct further research on this topic. This implies that their context can encourage this type of research. That is to say, in this case, the researchers will have access to information so that they can analyse ICT-enriched science classes. They should also have access to literature on this subject, which they can use as a foundation for their study and plan. Moreover, the availability of equipment should be ensured. This also concerns legislation and ethics since if it is illegal or unethical for researchers to approach the context or data, they will probably not opt for that topic.

This shows that the topics of the articles published can provide insights into the context and conditions that define the researchers' routine and life. This relates to the general social trends as mentioned as well as the potential and possibilities of individuals and groups (Pring, 2000; Cohen et al., 2007; Walliman, 2010).

The research

Having emphasised the basic theory about the use of ICT in science teaching, it is now possible to focus on the research itself by discussing its rationale, research questions and methodology.

The rationale behind the research and the importance of dissemination

This paper focuses on the topics of research journals, which represent the means of dissemination. It is important, therefore, to emphasise the major theoretical issues associated with dissemination as a process.

According to Bywood et al. (2008), dissemination aims to promote change. As a result of announcing and letting people be aware of research findings, these people might consider adopting new knowledge, skills and attitudes. Dissemination, therefore, is linked to the tendencies of research. In other words, by investigating the dissemination of research through journal articles, books, conference records and other similar activities, it is possible to identify what topics attract the interest of researchers and influence the approaches they select, the potential of their work and the challenges they want to deal with (Pring, 2000; Bywood et al., 2008).

Furthermore, as Lin et al. (2019) mentioned, the interests of researchers, which is reflected in the articles published, are influenced by the general social trends and phenomena. For example, in the case of this research, if articles on the use of ICT in science teaching were published, it was probably because a general social tendency to include ICT in science sessions exists. This is the outcome of other trends

as well, as it shows that there is interest in ICT, its possibilities and the use of ICT in teaching while there also exists considerable interest in science as a subject.

However, publication trends do not reflect only the past or present interests of researchers. They can also influence future directions and routes of research. All the people who publish their work in journals or other modes of dissemination expect to be heard and read mostly by other researchers and peers. They also expect to receive feedback or opportunities for cooperation in their work. This helps them continue their research on the topic that interests them. For example, researchers who publish articles and research on implementing ICT in science education can get comments on what they have concluded and achieved. This might lead to new ideas on the topic and new patterns of using ICT in science classes, which is a form of development.

In short, through the study of journal articles, it is possible to understand what was and is considered important in an area of study and hypothesise about how it can be improved. Such a study can also reveal how easy it is for researchers to investigate this particular field (Pring, 2000; Lin et al., 2019). The rationale behind this study concerns this point. By investigating articles concerning the use of ICT in science teaching, it can give insights into the attention that researchers pay towards that field.

Research questions and hypothesis

Over the last decade, several research projects have attempted to identify the trends in the fields of science education as well as the use of ICT in education as revealed by the published articles. In regard to the former, researchers such as Chang et al. (2009) and Lin et al. (2019) concluded that ICT in science education is a common topic covered by journals along with other ones such as teaching practices, learners' ideas and misconceptions, curricula, teacher development, social dimensions of science and informal science learning. These outcomes drive the studies published in journals specialising in the field of science education.

In regard to the latter, researchers and projects such as those by the Australian Communications and Media Authority [ACMA] (2008), White (2008) and Baydas et al. (2015) concluded that articles on the use of ICT in education might be focused on topics such as the impact of ICT on learning, teachers' professional development, connectivity, social networking, infrastructure and equipment, innovation, the pace of development and new learning modes such as distance education. These findings were derived from various resources for research dissemination.

So, the topic of ICT in science teaching was found to be attracting the interest of researchers (Chang et al., 2009; Lin et al., 2019). However, there are very few projects that are attempting to specifically identify the subtopics related to the use of ICT in education in which researchers are interested. Therefore, this research was designed to expand and enhance the findings of previous projects. This was done by further specialising the findings. The articles published in refereed journals were examined and categorised based on the theme they negotiated. Then, it was identified whether they were relevant to the implementation of ICT in science teaching. Furthermore, the study identified which of the following subtopics the articles were related to: use as a tool; computer-assisted learning; computer-assisted inquiry; distance learning in science education; or integration. The research questions were formed as follows:

1) What portion of articles on science education actually focus on the topic of the use of ICT in science teaching?
2) Which subtopics of ICT implementation in science learning are found to be researched in articles?
3) Which of these subtopics are discussed more frequently?
4) Is there a statistically significant difference between the journals that specialise in science education and the others that specialise in education in general?

By exploring these questions, this study aimed to validate the hypothesis that articles are published on all the sub-topics of ICT implementation in science teaching (Pring, 2000; Salihi, 2015; Lin et al., 2019).

Research methodology

Keeping in mind the aforementioned issues, this research project was designed to provide insights into the interest of researchers in the use of ICT in science teaching. The study examined issues of refereed journals that are published monthly. Any relevant research conducted was based on the data obtained either from journals that specialise in science education (Chang et al., 2009; Lin et al., 2019) or from a variety of modes of dissemination, such as books, conferences and journals (ACMA, 2008; White, 2008; Baydas et al., 2015).

The selection of data sources for this study was based on a similar approach. The most appropriate method of data collection involved, in this case, journal articles. Articles were gathered from 120 issues of ten refereed journals that were published monthly. Two types of journals were selected. The first was journals that specialised in science education. The second was journals that focused on education

research in general. Due to restrictions, mainly of time, it was decided that other journals, such as the ones that specialised in ICT in education, would be researched at a later stage. The number of articles published per issue was not standard. The articles examined were published between 2011 and 2020. The analysis of the data was based on descriptive statistics. This approach has been adopted in similar projects that have been carried out previously. At first, data collection was based on text analysis through the use of keywords. All articles collected were examined thoroughly in order to identify the topic they explored (Cohen et al., 2007).

First, the number of articles that addressed ICT use in science teaching was identified. Absolute and relevant frequencies were calculated for that purpose individually for each type of journal and then as a total. This was expected to provide the answer to the first research question. Second, the study identified which of the five subtopics each one of these articles addressed. As in the case of the first question, absolute and relevant frequencies were calculated. This was expected to answer the second research question. Finally, a comparison was made between the relevant frequencies calculated in response to the second question and the evaluation of the distribution. This evaluation could be done in a more accurate and justified way through an approved statistical test. In this case, the most appropriate one was the one-sample Kolmogorov–Smirnov test. This was expected to answer the third research question. Finally, for the fourth research question, a paired T-test was conducted between the relevant frequencies of the two types of journals. Statistical tests were conducted with the help of SPSS (IBM Corp, 2020).

Findings

The results show that overall, out of 40370 articles, 9756 articles emphasised the use of ICT in science education. The relative frequency was 24.17%. The results are shown in Tables 1 and 2.

Table 1

Number of articles in total and number of articles on ICT use in science teaching

Type	Articles	Value	Relevant frequency
Journals on science education	Total articles	38482	
	ICT in science teaching	7868	20.44%
Journals on science education	Total articles	8050	
	ICT in science teaching	1888	23.45%
Sum	Total articles	40370	
	ICT in science teaching	9756	24.17%

Table 2

Frequencies and relevant frequencies for subtopics in both types of articles

Subtopic	Science education		Education studies		Sum	
	Value	Relevant frequency	Value	Relevant frequency	Value	Relevant frequency
ICT as tool	1518	19.29%	1888	23.45	2006	20.56%
Computer-assisted learning	1447	18.39%	420	22.25	1814	18.59%
Computer-assisted inquiry	1613	20.50%	299	15.84	1968	20.17%
Distance learning in science	1559	19.81%	285	15.10	1957	20.06%
Integration	1731	22.00%	428	22.67	2240	22.96%

This means that almost one out of five articles on science education in the journal issues investigated addressed the topic. Generally, this finding is compatible with that of similar research projects of previous decades. Moreover, it proves that researchers in the field of science education are interested in that topic (Chang et al., 2009; Lin et al., 2009). This could also be a part of the wider trend of research on ICT and its potential to assist in teaching and education, including in specialised subjects such as science (ACMA, 2008; White, 2008; Baydas et al., 2015). Additionally, it proves that there is room and opportunity for research in that field. Researchers can probably identify the appropriate contexts for examining all the dimensions or subtopics in regard to the use of ICT in science teaching. This can probably ensure the availability of any kind of means, funding and conditions necessary for conducting such research (Pring, 2000; Cohen et al., 2007; Walliman, 2010). In short, the answer to the first research question is that adequate interest in the field of ICT in science teaching exists as revealed by the trends (Bywood et al., 2008).

In regard to the second research question, the findings show that all defined subtopics of ICT implementation in science teaching could be identified in the journal articles of the last decade when they were examined. No subtopic was missing. This can be attributed to the interest of researchers in all aspects of the use of ICT in science as described in the relevant literature. These involve the use of ICT as a tool, in computer-assisted learning or inquiry, distance education or integration (Newton & Rogers, 2001; Osborne & Hennessy, 2003; Derby & Campbell, 2005; Salihi, 2015). This finding also implies that there is interest in treating the topic from a holistic point of view by taking advantage of all of the advantages that ICT

can provide. Researchers probably wish to examine different advantages of using ICT in science teaching. This can be done through already established paradigms where educators might teach science according to mainstream or traditional routes while being assisted by ICT, which they can use as tools. This can also be using innovative paradigms, such as computer-assisted inquiry, where the innovation relies and depends on the use of ICT. Therefore, researchers and educators probably have an interest in identifying new teaching paradigms without abolishing established ones (Pring, 2000; Newton & and Rogers, 2001; McFarlane & Sakellariou, 2002; Osborne & Hennessy, 2003; Derby & Campbell, 2005; Bywood et al., 2008). In regard to the third research question, using the Kolmogorov–Smirnov test, it was concluded that the distribution was normal among the subtopics. This means that the pre-stated hypothesis that there is an equal interest of the researchers in all subtopics was proved. The results are shown in Table 3.

Table 3

One-Sample Kolmogorov–Smirnov Test

N		5
Normal parameters	**Mean**	1997.0000
	Std. deviation	154.15901
Most extreme differences	**Absolute**	0.277
	Positive	0.277
	Negative	-0.198
Test statistic		0.277
Asymp. Sig. (2-tailed)		0.200

Finally, as shown in Table 4, a comparison between the relevant frequencies of the two types of journals shows that there seems to be no differentiation in the trends. The statistical difference seems to be insignificant. More specifically, the t-value was calculated at t = -0.0189. The p-value was calculated at p = 0.492565. The result is not statistically significant at $p < 0.05$.

Table 4

Comparison between the relevant frequencies of the subtopics of the two types of journals

		Mean	**N**	**Std. deviation**	**Std. error mean**
Pair 1	VAR00001	19,998	5	1,35852	0,60755
	VAR00002	19,862	5	4,04086	1,80713
Paired samples correlations					
			N	Correlation	Sig.
Pair 1	VAR00001 & VAR00002		5	-0,086	0,891
Paired samples test					

		Mean	N	Std. deviation	Std. error mean
		Paired differences			
		Mean	Std. deviation	Std. error mean	95% confidence interval of the difference
					Lower
Pair 1	VAR00001 - VAR00002	0,136	4,37211	1,95527	-5,29269

Conclusions

The trends shown in this research revealed that researchers show considerable interest in further exploring the field of ICT use in science teaching. There is equal interest in all five justified dimensions of the field: using ICT as a tool; computer-assisted learning; computer-assisted inquiry; distance education; and integrating activities. All these are compatible with the topics analysed by theorists (Newton & Rogers, 2001; McFarlane & Sakellariou, 2002; Osborne & Hennessy, 2003; Salihi, 2015).

Aside from the interest, these trends revealed that researchers can study this topic and its subtopics. In other words, researchers can have access to data obtained from classrooms, sessions, educators and stakeholders. There is also the question of the availability of relevant infrastructure. Overall, conditions assist and facilitate such research studies (Pring, 2000; Cohen et al., 2007; Walliman, 2010). Furthermore, these findings showed that research in this field is likely to continue in these directions (Pring, 2000; Bywood et al., 2008).

To generalise and strengthen these conclusions, further research can be conducted. Such work might focus on a greater sample and variety of articles and journals over a longer period of time. Additionally, future projects can compare the trends between journals of different specialisation or between articles published in different periods of time. Lastly, they can triangulate the data by conducting interviews with researchers working on this topic (Cohen et al., 2007).

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TRACING DIGITAL COMPETENCE N TEACHER EDUCATION: EXPLORING SWEDISH EDUCARE PROGRAM CURRICULUM PLANS

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Abstract

The importance of digital competence and 21st-century skills for pupils and teachers continues to be stressed in policy documents. This paper explores how digital competence for student teachers is expressed in program curriculum plans for Educare student teachers. In studying the program curriculum plans for 12 higher education institutions, traces of digital competences were found. The results were mainly related to a micro-level, i.e., involving student teachers' own skills. A trace of design was also found in one document which could be interpreted at the meso-level, while there were no traces at the macro-level. If the intention is for Educare policy to emphasize the importance of digital competence and 21st-century skills for pupils, these traces must most likely be strengthened in order to support teacher students' digital competence.

Introduction

In the steering documents, policy makers continue to emphasize the need for pupils to acquire 21st-century skills. These skills encompass critical thinking, problem solving, and digital competence in the digital classroom (European Commission [EC], 2018; Eurydice, 2018; Organisation for Economic Co-operation and Development [OECD], 2018). For pupils and teachers, digital competence also involves more efficient use of digital technologies for teaching and learning, as well as developing digital competence (EC, 2018).

In Sweden, the government continues to revise and refine the goals for the use of digital technologies in schools, for example, in the National Digitalization Strategy for Schools (Swedish Government, 2017). However, the impact of the use of digital technologies on teaching and learning remains unclear (Swedish National Agency for Education, 2016). Despite increases in resources and access to digital technologies, pedagogical development and digital competences have not expanded to the same extent (Swedish National Agency for Education, 2016; Swedish Schools

Inspectorate, 2012). Proposals to strengthen digitalization in schools were introduced in the Swedish National IT strategy (Swedish Government, 2014) and further strengthened in the National Digitalization Strategy for Schools (Swedish Government, 2017) in terms of adequate digital competency, which have been adopted (Eurydice, 2018). Further, the Swedish National Agency for Education pointed out the necessity for professional development (PD) in the area of digitalization for all levels in the schools. This applies to digital competence for school staff on all levels: teachers, school leaders, and school organizers of Swedish schools (Swedish National Agency for Education, 2016).

For pupils and teachers, the use of digital technologies, such as one-to-one computer initiatives, is reported in the international literature (Cuban, 2013; Williams, 2008; Zheng, et al., 2016). These initiatives through the use of digital technologies provide opportunities for technology-enhanced learning and school change (Fullan, 2001; Grönlund, 2014). The findings in international studies are seen in studies in the Swedish context as well (Håkansson Lindqvist, 2015a; 2015b; Grönlund, 2014; Tallvid, 2015).

At the same time, teacher education has not placed the same focus on developing student teachers' digital competence (Tømte et al., 2015) to work with pupils' digital competence. In a study in Turkey and Sweden, teacher students stress the importance of digital competence both for their professional careers as well for their future pupils (Karakoyun & Lindberg, 2020). In the Swedish context, the concept of adequate digital competence was introduced in the 2017 national strategy for the digitalization of the K-12 school system. Although the definition of adequate digital competence remains vague (Olofsson et al., 2020). The strategy has led to changes regarding digital competences in the curriculum plans on all school levels, including school-age extended education or Educare.

Educare extends the role of school as an integrated organization of the school. Here, Educare may offer opportunities for linking formal and informal learning with digital technologies. For Educare teachers, these tensions between informal and formal learning may provide unique opportunities to support pupils' 21st-century skills such collaboration, critical thinking, creativity, problem-solving and digital competence. However, in order to support pupils in gaining these skills, teachers themselves need skills in digital competence.

Aim and Research Questions

The aim of this paper is to explore how digital competence in Higher Education Institutions' (HEIs') programme curriculum plans for Educare teachers is expressed:

1. *How are the digital competence goals for Educare teacher students expressed?*
2. *How can these goals be understood using the framework for pedagogical digital competence?*

This paper will provide insights into how traces of digital competence are expressed in the program curriculum plans for Educare student teachers and how these traces can be understood from the micro-, meso- and macro-level in the Pedagogical Digital Competence (PDC) framework. These insights will be of importance for teacher students, teacher educators, and higher education institutions in efforts to prepare Educare teacher students for supporting adequate digital competence for pupils. While the results of this paper will be specific to Educare teacher students and teacher education, the knowledge contribution may be of interest to teacher education in a national and international perspective.

Previous research

Educare extends the role of school as an integrated organization of the school. In Sweden, Educare has a long tradition and is well established, with nearly all 6-8 year old pupils attending leisure time centres (Klerfelt & Haglund, 2014). For Educare teacher education, the latest change in 2011 has meant a shift from leisure time pedagogue toward teacher in a leisure time centre, which involves both leading Educare activities, and teaching pupils in grade 4-6 (Klerfelt & Haglund, 2014). Haglund and Boström (2020) report that research shows that the preconditions for Educare teachers are not favorable, for example, having fragmented tasks and little planning for pedagogical activities. However, leisure time centres are regarded as important for pupils' learning and care.

As policy measures continue to push a focus on access, integration, and developing frameworks for use and curriculum, pupils' perceptions and digital competence continue to develop outside the classroom, rather than within the classroom (Aesert & van Braak, 2014). Here, the somewhat more informal settings which Educare, offered in leisure-time centres, provides, may be seen as a way to strengthen digital competences for pupils. In a study on educational status of Educare in the Nordic countries, Pálsdóttir (2018) reported that Educare was found to extend the role of schools as an integrated organization of the school. Educare was characterized by

tensions between formal school learning and informal learning, resulting in the need for changes in teacher education to focus on leisure and informal learning (Pálsdóttir, 2018). For Educare teachers, these tensions between informal and formal learning may provide unique opportunities to support pupils' 21st-century skills such collaboration, critical thinking, creativity, problem-solving, and digital competence. However, in order to support pupils in gaining these skills, teachers themselves and teacher students need skills in digital competence.

In Sweden HEIs adhere to the same law, the 1994 Higher Education Act and Higher Education Ordinance. According to the Higher Education Act, all programs must have a program curriculum plan for study programs and courses offered at HEIs. In the program curriculum plan, the courses, which are included in program, must be stated as well as requirements for special eligibility or competences. There must also be a specific course plan for each course. The course plan includes the level of the course, the number of credit point, the target of the course, special eligibility, and the assessment forms. Here, HEIs are allowed to have own regulations, for example, what literature is included and which parts of the course have mandatory attendance (Swedish Higher Education Authority [UKÄ], 2017). How digital competence for Educare student teachers is expressed in the program curriculum plan may be of interest to study.

Pedagogical digital competence

From (2017) describes the necessary skills for teaching with digital technologies as Pedagogical Digital Competence (PDC). In this framework, three interrelated levels are involved: *micro, meso* and *macro*. The micro-level, the interaction level, involves pedagogical interaction with pupils. The meso-level refers to the course level, the design and implementation of courses and the infrastructure of education. The macro-level encompasses an organizational level, including educational management and development (From, 2017).

Method

The program curriculum for the HEIs (N=12) which offer the Educare program of teacher education are studied using qualitative and quantitative text analysis (Bergström & Boréus, 2005). The program curricula studied were each between 4-10 pages, totalling some 76 pages. The HIEs are identified as (HEI1-HEI12). The quotes referred to are translations from Swedish to English by the author. The results will be analysed using the framework for PDC. This paper will provide insights into how traces of digital competence are expressed in the curriculum for

Educare student teachers and how these traces can be understood from the micro-, meso and macro-level in the PDC-framework.

Results

In this section, the results are presented. First, the frequency of the word *digital* is presented; thereafter, the formulations in the Educare program curriculum are presented.

When studying the frequency of the word *digital* in the 12 HEI Educare program curriculum plan the word *digital* appeared between zero and eight times. In two of the programme curriculum plans the word *digital* was not mentioned and the highest number of eight was seen in one program curriculum plan. The frequency of the word digital is illustrated in Table 1.

Table 1
Frequency of the word "digital" in HE Educare curriculum plans

Frequency of the word *Digital*	HE Educare curriculum plans
0	2
2	4
3	3
4	2
8	1

In summary, in the majority of the Educare program curriculum plans, the word digital was noted 2-3 times. In the formulations, using the word *digital* 10 of the 12 HEIs used the same formulation for the knowledge goals for teacher students:

> Show the ability to assuredly use digital tool in the pedagogical activities and take into account the importance of different media and digital environments role in these activities

This goal describes the need for the Educare teacher student regarding personal use of digital tools in pedagogical activities. This goal, or a corresponding goal, was not found in the Educare program curriculum plan in two HIEs.

The use of the word *digital* was also seen in one HEI, which referred to a specific course related to digital media culture for Educare teachers: Children's digital media culture for teachers in Educare (HEI1).

The word *digital* also occurred in the how digital tools were integrated into the courses for the Educare teacher students: "That knowledge and skills in digital tools and different media's role for pedagogical activities are integrated in both subject and general education courses" (HEI7). Another HEI referred to this as "the knowledge skills and ability to use digital tools is integrated in courses" (HEI6). The occurrences of the word digital for one HEI refers to how the program itself uses digital platforms, open teaching resources and distance technology (HEI3) to support Educare student teacher learning. Another notes the use of digital reports being used in examinations (HEI12).

One occurrence of the word *digital* is in a local goal:

> To show digital competence which is relevant for the profession through the use of different digital tools, to be able to design learning environments with the support of digital tools and critically review different forms of digital material and social media. (HEI2)

This goal combines personal knowledge and skills and pedagogical activities which are relevant for the profession along with the design of learning environments.

Discussion and Conclusion

The aim of this paper was to explore how digital competence in HEIs' programme curriculum for Educare teachers is expressed. The research questions were 1) *How are the digital competence goals for Educare teacher students expressed*? and 2) *How can these goals be understood using the framework for pedagogical digital competence?*

From (2017) describes the necessary skills for teaching with digital technologies as Pedagogical Digital Competence. In this framework, three interrelated levels are involved: micro, meso and macro. The micro-level, the interaction level, involves pedagogical interaction with pupils.

When studying the Educare program curriculum plans for Educare teacher students, the goals for the use of digital tools have the focus on personal knowledge of and skills with digital tools and media. Here, this goal in formulated in almost all of the HEIs. Further, the skills and knowledge are, in a few HEIs, noted to be integrated with other specific subject course and basic education courses. In one case, a specific course that is relevant for Educare teachers is provided. The Educare teacher students also use digital tools in their study programs; several of the Educare program curricula note the use of digital platforms, digital tools, and other resources,

for example for examination. The first PDC level, the micro or interaction level, involves pedagogical interaction with pupils. As there are goals for most of the HEIs regarding digital tools for the Educare teacher students, it is most likely that this knowledge and these skills on the micro-level are important for the pedagogical interaction with pupils (Tømte et al., 2015; Karakoyun & Lindberg, 2020). In their coming profession as teachers, digital competence will be necessary (Grönlund, 2014; Håkansson Lindqvist, 2015a, 2015b; Tallvid, 2015).

The meso-level refers to the course level, the design and implementation of courses and the infrastructure of education. As noted above, when studying the Educare program curriculum plans for Educare teacher students, the goals for the use of digital tools focus on personal knowledge of and skills with digital tools and media. In one HEI, the idea for knowledge and skills of digital competence is linked to designing a learning environment. This can be interpreted as an example of the meso-level in which the Educare teacher student is prepared for designing pedagogical activities, based on personal competence, yet moving forward to a more systematic design of pedagogical activities. Designing these activities will be important to support pupils' learning and take advantage of and bridge formal and informal learning activities (Aesert & van Braak, 2014) and support pupils' digital competence (Olofsson et al., 2015; Olofsson et al., 2020).

According to From (2017), the macro-level encompasses an organizational level, including educational management and development. In this small study, this level does not appear to come about. This may be related to the level of documents, the Educare program curriculum plans for Educare teacher students, which may not take on this organizational level, but it appears in other relevant steering documents. As noted above, the goals for the use of digital tools have their focus on personal knowledge and skills with digital tools and media for teacher students. It is possible that the idea of adequate digital competence (Olofsson et al., 2020) which involves all actors in schools has not yet become visible in these documents. How these actors work to continue to support adequate digital competence will be of importance in order to meet the intentions set in policy (EC; 2018; OECD, 2018; Swedish Government, 2017).

In summary, the results of this small study point toward a continued focus on personal skills regarding digital competence for teacher students in an Educare teachers program. A trace of design can be seen in regard to a more systematic planning of pedagogical activities using digital tools and media. Perhaps the most interesting finding in this study is the lack of goals for skills and knowledge in two of the HEIs in this study, despite strong ambitions in the steering documents. Digital skills and

digital competence are important for teacher students in order to support pupils' knowledge and skills or digital competence in practice. In order to achieve the intentions of policy and to close the gap, these traces of digital competences in teacher education in the Swedish Educare programme curriculum plan should most likely be strengthened.

Limitations, Implications for Practice and Future Research

The main limitation of this study can be seen in the use of text analysis. The work with digital competence in preparing teacher student in practice may present another picture than that of the documents studied. Regarding implications for practice, how steering documents are revised to support the intentions of policy for example in program curriculum plans will be of interest to study. How time, resources and professional development are made available to support Educare teacher students, and teacher students in other programs in their work with digital tools will be important. This also concerns the prioritization of digitalization as one of many important areas in schools as organizations. Future research could involve a deeper study of course plans to further study how the curriculum goals are transformed to work in practice with digital tools in order to support teacher students' work with pupils.

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THE EFFECTS OF THE FIRST AND SECOND WAVE OF COVID-19 PANDEMIC ON E-LEARNING IN HIGHER EDUCATION: A COMPARATIVE ANALYSIS FOR SLOVENIA

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Abstract

The Covid-19 pandemic is responsible for the biggest disruption to education in recent history. Therefore, the main aim of the paper is to provide new insights of the implications of the first and second wave of pandemic on e-learning in higher education on a sample of 1049 and 450 Slovenian students from the first and second wave of pandemic, respectively. The results show that the students were the most satisfied with real-time online lectures, followed by asynchronous forms of lectures, whereby some differences in e-learning experience of higher education students between the first and second wave of pandemic are identified.

Introduction

The Covid-19 pandemic caused by the novel coronavirus SARS-CoV-2 has radically transformed the lives of people all around the globe, including higher education students. The outbreak of health crisis seemingly emerged in China during December 2019 and started to spread throughout the world and on 11 March 2020, the World Health Organization (WHO) declared the Covid-19 a pandemic (Ghebreyesus, 2020). Apart from the devastating health consequences for those directly affected by the virus, the pandemic holds major implications for the way higher education students live and work, in turn profoundly affecting their overall learning experience. Namely, to curb the spread of Covid-19, educational institutions around the world moved rapidly to transfer various courses from onsite to online, with online learning (e-learning) thereby becoming a mandatory teaching and learning process of educational institutions (Aristovnik et al., 2020a).

Like other countries around the world, Slovenia is not immune to Covid-19. The first case of Covid-19 was confirmed in the country on 4 March 2020 and soon afterwards, on 12 March, the Slovenian government also officially declared an epidemic (Government of the Republic of Slovenia, 2020), bringing Slovenian society to a standstill. In early May 2020, the number of people infected with the

new coronavirus was declining and on 14 May 2020, the government declared the end of the Covid-19 epidemic within Slovenian borders, becoming the first European country to do so (Novak, 2020). Slovenia's initial steering and handling of the coronavirus outbreak was cited as a significant success when Europe faced the first wave of the pandemic and earned praise for its effectiveness (The Slovenia Times, 2020). With assurances from both health care and the government that they were well prepared for the second wave of the Covid-19, the number of new cases began to rise with the opening of educational institutions in the start of October 2020 and the government started adopting new decrees. On 18 October, the government then declared an epidemic again (European Liberal Forum [ELF], 2021; Republic of Slovenia Ministry of Health, 2020). Since the epidemiological situation in Slovenia has improved during May 2021, the government Covid-19 advisory group has proposed to formally end the Covid-19 epidemic on 17 June 2021, whereby this does not mean a complete relaxation of the Covid-19 related measures (Slovenian Press Agency [STA], 2021).

With the beginning of the first wave of Covid-19 pandemic, the Slovenian government decided to close all school facilities on 16 March 2020, like other countries around the world. Some educational units had already suspended personal attendance some days before. The Covid-19 situation swiftly transitioned the education process from onsite to online study, causing many challenges to higher educational institutions as well as students (ELF, 2020). The Slovenian government’s response to the first, and later to the second wave of the pandemic were measures related to restricting onsite teaching, putting higher education students in an online environment, which was unknown to many Slovenian students. Accordingly, the main aim of the paper is to provide new insights into the implications of the first and second wave of Covid-19 pandemic on e-learning in higher education in Slovenia.

The paper is organized as follows. After the introduction section, which describes the occurrence of the pandemic crisis and transferring to an online mode of life, the next section presents the background in which a short literature review is provided. The following section explains methodological framework, including sample, data, and methodological approach. The next section presents the main results of the comparative analysis between the first and second waves of the Covid-19 pandemic. The paper ends with conclusion in which the main findings are summarized.

Background

Most of the existing studies on e-learning and e-teaching in the period of the Covid-19 pandemic were focused on the response of higher education institutions to lockdown related measures restricting personal attendance of students in educational institutions (Mseleku, 2020). The most frequent response was to close all educational institutions and cancel all physical class meetings (Prokopenko & Berezhna, 2020; Ratten, 2020). Consequently, most educational institutions in higher education established or built their online learning systems as an alternative to onsite teaching and learning to continue teaching and learning during the Covid-19-induced tough times (Daniel, 2020; Wotto, 2020; Zhu & Liu, 2020).

While onsite approach has been preferred by most lecturers and students, adjusting to online learning posed a new challenge to both. Accordingly, the main question that is of interest to many is whether online learning is better than onsite learning (Mseleku, 2020). During the Covid-19 pandemic, lecturers play an important role as facilitators of online learning. However, due to a sudden shift to e-learning, ordinary lecturers did not have adequate time to adjust to the new teaching platforms. Just like lecturers, students also had challenges in adjusting to e-learning (Mseleku, 2020). In this context, some of the recent studies revealed that students found it difficult to adjust to online learning styles (Aristovnik et al., 2020a; Baticulon et al., 2021). This implies that students were generally not prepared for e-learning. This was also confirmed by Aristovnik et al. (2020a), who conducted the most comprehensive and large-scale study to date on how students perceive the impacts of the first wave of COVID-19 crisis in early 2020 on various aspects of their lives on a global level.

Methodological Framework

The data for this paper are derived from the most comprehensive and large-scale global student survey entitled "Impact of the Covid-19 Pandemic on Life of Higher Education Students" aimed at examining students' perceptions on the impacts of the first and second wave of Covid-19 pandemic on various aspects of their lives on a global level (Aristovnik et al., 2020a). The global student survey was initially launched by the Faculty of Public Administration – University of Ljubljana (Slovenia) and later, with the support of international partners, disseminated worldwide. The online questionnaire was adapted and extended from the European Students' Union (2020) survey. The questionnaire was formed by mainly closed-ended questions. It focused on socio-demographic, geographic, and other aspects pertaining to the life of higher education students, such as academic online work and life, social life, emotional life, personal circumstances, changes in habits, the roles, and measures of institutions as well as personal reflections on Covid-19

(Aristovnik et al., 2020b). At first, the online questionnaire was designed in English and later translated into six different languages (i.e., Italian, North Macedonian, Portuguese, Romanian, Spanish, and Turkish).

The web-based survey was carried out online between 5 May 2020 and 15 June 2020 for the first wave and between 20 December 2020 and 30 April 2021 for the second wave of the Covid-19 pandemic, when most of the nations experienced the arduous restrictions imposed by the lockdown. The participation in the study reached global proportions, by exceeding 30,000 and 10,000 responses submitted by students for the first and second wave of Covid-19 pandemic, respectively.

The survey was intended to all higher education students who were at least 18 years old, representing the target population of this study. The respondents were recruited by convenience sampling facilitated by advertising on university communication systems around the world and social media. Before the start of the survey, all students were informed about the details of the survey and gave their informed consent before participating. Participation in the online survey was anonymous and voluntary, and students could withdraw from the study without any consequences. However, since the respondents were not obliged to complete the questionnaire in full, the number of respondents varied across questions (Aristovnik et al., 2020b).

This paper is focused on the effects of the second and first wave of Covid-19 pandemic on e-learning experience of higher education students in Slovenia. Accordingly, the analysis utilizes the data from selected parts of the questionnaire covering selected aspects related to e-learning. The final dataset consisted of 1,049 responses from the first wave and 450 responses from the second wave of the Covid-19 pandemic (see Table 1).

The survey participants' average age during the first and second wave of the pandemic was 21.8 and 20.9, respectively, showing that the sample for the second wave consists of younger students. This is further confirmed by the share of students aged 18-20, which is much higher for the second wave (64.7%) compared with the first wave (40.2%) of pandemic. Thus, it can be assumed that most students covered in the sample for the second wave of the pandemic were freshmen, i.e., students enrolled in the first year of bachelor's degree. According to the other relevant most of the participants were female, domestic, full-time, and first-level students with the latter category being more represented in the sample for the second wave of pandemic. Finally, the higher share of students was in the social sciences (especially for the second wave of the pandemic), followed by natural and life sciences, applied sciences and arts and humanities.

Table 1

Socio-demographic Characteristics of the Survey Participants in the First and Second Wave of Covid-19 Pandemic – Number (%)

Characteristics	Sample	
	First wave	Second wave
Gender		
Male	315 (30.6)	120 (27.1)
Female	715 (69.4)	323 (72.9)
Citizenship		
Yes	925 (88.9)	375 (83.7)
No	116 (11.1)	73 (16.3)
Status		
Full-time	1000 (95.9)	420 (94.8)
Part-time	43 (4.1)	23 (5.2)
Level of study		
First	807 (77.7)	404 (91.4)
Second	226 (21.8)	36 (8.1)
Third	6 (0.6)	2 (0.5)
Field of study		
Arts and humanities	41 (4.0)	4 (0,9)
Social sciences	531 (51.8)	396 (90.0)
Applied Sciences	62 (6.0)	15 (3.4)
Natural and life sciences	392 (38.2)	25 (5.7)
Note. The final sample consists of 1,049 respondents for the first and 450 respondents for the second wave of Covid-19 pandemic. The number of respondents may differ due to missing values.		

Source: CovidSocLab, 2020, 2021; authors' calculations.

The selected individual aspects or elements of related to e-learning experience of higher education students (i.e., satisfaction or agreement) were measured on a 5-point Likert-type rating scale ranged from 1 (lowest value) to 5 (highest value) (Aristovnik et al., 2020a). To identify the significant differences between the first and second wave of Covid-19 pandemic an independent-samples t-test is conducted. This parametric statistical technique is a very robust method, and it is the most used method for detecting differences in averages between two groups (Rasch et al., 2007). Therefore, all the results are presented in the form of average values of responses.

Results

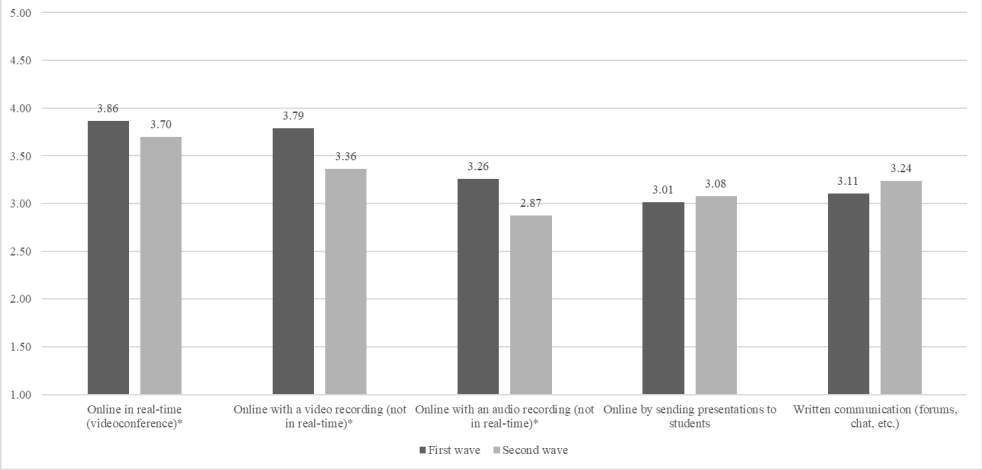
Online teaching is not just about providing learning materials online. In this context, the important role is being put on teaching staff. Namely, they must adapt new approaches or techniques of learning by considering the new mode delivery,

so that students do not feel isolated and alone in the learning process (Aristovnik et al., 2020a). To contribute to the best possible organization of online teaching and the way it is conducted, at the time of the lockdown, educational institutions were dependent on the existing knowledge of their students, teachers and information and communication (ICT) equipment owned by them as an institution and their employees privately. Consequently, several different forms of online lectures were established. The students were therefore asked about their satisfaction with different forms of online lectures after the transition from an onsite to an online learning environment (see Figure 1).

During both waves of the pandemic students were the most satisfied with real-time online lectures, followed by asynchronous forms of lectures. However, the comparison reveals that during the second wave the satisfaction was significantly lower in the case of online real-time, video recording and audio recording lectures, whereby the differences between the remaining forms of online lectures are found to be not significant.

Figure 1

Students' Satisfaction with Different Forms of Online Lectures



Note. 1) Measurement: A five-point Likert scale (from 1 – very dissatisfied to 5 – very satisfied. 2) Significance: *p<0.05.
Source: CovidSocLab, 2020, 2021; authors' calculations.

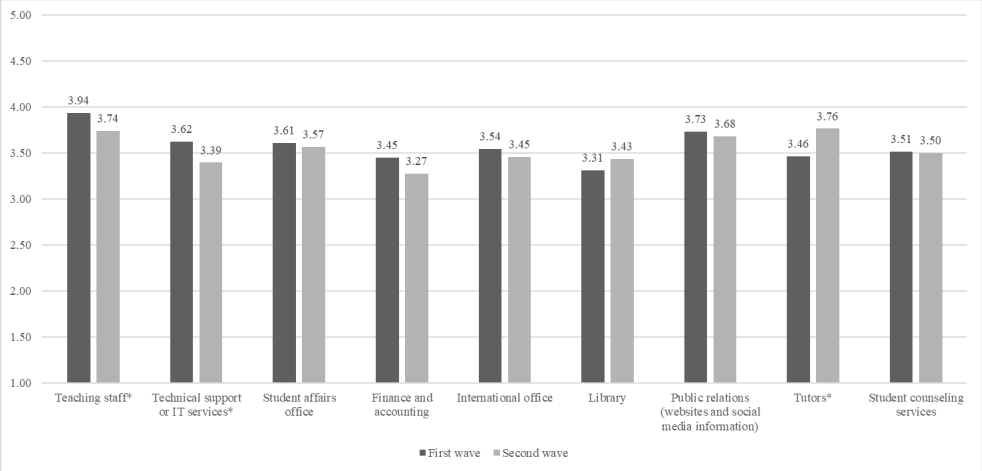
Students also found it difficult to focus during the online teaching in comparison to onsite teaching and reported worse perceived study performance since onsite classes were cancelled. Additionally, the comparison indicates that during the

second wave (M=3.98, SD=1.22) students reported significantly higher level of difficulty focusing than during the first wave (M=3.71, SD=1.28) of the pandemic ($p<0.05$), whereby the difference in perceived study performance was not significant. Namely, studying from home requires more self-discipline and motivation to follow through online lessons, especially at the beginning of that lockdown period when students were getting used to the new system. In a sudden and unpredictable crisis such as the Covid-19 pandemic, many questions emerge, and students need the support of various services (Aristovnik et al., 2020a). Accordingly, students were also asked how they were satisfied with the support of different options of teaching staff and services (see Figure 2).

During the first wave of the pandemic, the highest students' satisfaction with the support can be observed for teaching staff, which is identified to be significantly higher compared to the second wave of the pandemic. This was followed by students' satisfaction with the support of public relations and the technical support of IT services, with the latter being significantly lower during the second wave of the pandemic. On the other hand, during the second wave students were significantly more satisfied with the support of tutors compared to the first wave of the pandemic. For the remaining staff categories, no statistically significant results were found; however, the lowest satisfaction with the support in both waves of the pandemic can be observed for finance and accounting.

Figure 2

Students' Satisfaction with Support of Teaching and Support Staff



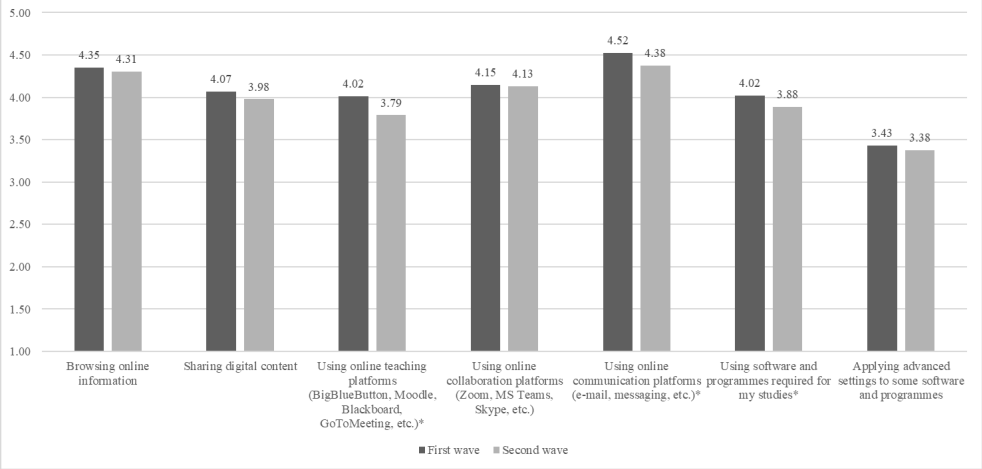
Note: 1) Measurement: A five-point Likert scale (from 1 – very dissatisfied to 5 – very satisfied. 2) Significance: *$p<0.05$. Source: CovidSocLab, 2020, 2021; authors' calculations.

Finally, students were also asked about their confidence in computer skills (see Figure 3). Namely, the new and unprecedented circumstances have reshaped the basic conditions for distance teaching, students' digital skills, i.e., skills enabling the use of ICTs and digital service (ELF, 2021). Still, deficient ICT infrastructure, computer skills, as well as the perception of a higher workload, prevented students from perceiving their own improved performance in the new teaching environment (Aristovnik et. al., 2020a).

In general, the results show that the students were most confident in the skills of using online communication platforms, e.g., e-mail, messaging, etc., followed by the skills of browsing online information and skills of using online collaboration platforms, e.g., Zoom, MS Teams, Skype, etc. The students assessed their least developed skills as those connected with adjusting the advanced settings of some software and programmes and using online teaching platforms, e.g., BigBlueButton, Moodle, GoToMeeting, etc. However, compared with the first wave of the pandemic, students were in general less confident in all selected computer skills during the second wave of the pandemic, especially in skills related to adjusting the advanced settings of some software and programmes as well as skills related to using online teaching and communication platforms.

Figure 3

Students' Confidence in Computer Skills



Note: 1) Measurement: A five-point Likert scale (from 1 – strongly disagree to 5 – strongly agree. 2) Significance: *p<0.05.

Source: CovidSocLab, 2020, 2021; authors' calculations.

Discussion and Conclusion

The Covid-19 pandemic has disrupted learning and process on a global scale, with e-learning becoming a mandatory teaching and learning process of educational institutions. This study aimed at supplementing the existing empirical evidence with new insights into the implications of the first and second wave of pandemic on e-learning in higher education in Slovenia. The results show that during the second wave, the students were the most satisfied with real-time online lectures, followed by asynchronous forms of lectures, whereby the satisfaction was significantly lower in comparison with the first wave of the pandemic. This can be further explained by significantly lower satisfaction with the teaching staff in the second wave of the pandemic, however, still exceeding satisfaction with the support staff. Moreover, students also found it difficult to focus during the online teaching in comparison to onsite teaching, especially during the second wave of the pandemic. Surprisingly, the students are less confident in using online teaching platforms e.g., BigBlueButton, Moodle, GoToMeeting, etc. in the second wave of the pandemic.

One might expect higher students' satisfaction with different forms of online lectures and teaching staff as well as higher student confidence in computer skills during the second wave of pandemic. Nevertheless, the findings seem to be reasonable. In this context, it is worth noting that during the second wave of pandemic students experienced significantly higher levels of negative emotions e.g., anxiety and frustration, and significantly lower levels of positive emotions, e.g., hope and joy, compared to the first wave of pandemic. Moreover, during the time between the two waves of pandemic, which was characterized by high uncertainty, online examination systems and related software have improved, which heavily challenged students' confidence in computer skills. Finally, the sample for the second wave of the pandemic consisted predominantly of freshmen, i.e., students enrolled in the first year of a bachelor's degree, who are often more critical, and students from social sciences, who often lack appropriate digital skills. The latter can be therefore considered as a limitation of this study. Notwithstanding this limitation, the findings of the paper may be of benefit for policymakers and higher education institutions with a view to fully addressing the issues related to the current and any future pandemics.

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A STRATEGY TO TEACH CROSS-CULTURAL UNDERSTANDING: A SOUTH AFRICAN CASE STUDY

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Abstract

The outsider/insider assignment is a teaching strategy to simultaneously teach facts about cultural difference and skills for managing cross-cultural encounters in communication. A lecturer at a mainly monocultural university in South Africa developed an adapted outsider/insider assignment for a first year Business Communication course. The aim of this paper is to firstly report on the application of the adapted assignment applied in the Economic and Management field. Secondly, the researcher will report on the effect hereof on student learning. The findings indicate the value of both the outsider/insider assignment and the use of a reflection component based on the ORID-method. This effective teaching strategy can contribute to assessment practices of an educator in communication at higher education institutions and provide an example of a strategy with evidence of student learning.

Introduction

Teaching cross-cultural understanding is crucial in any business management programme (Kurpis & Hunter, 2017; Sit, Mak & Neill, 2017; Havis, 2020). However, to teach cross-cultural understanding in a monocultural classroom is a challenge. From a constructivist viewpoint "teaching is not a matter of transmitting but of engaging students in active learning, building their knowledge in terms of what they already understand" (Biggs & Tang, 2007, p. 21). Garcia (2014) identified one teaching strategy which can assist with the challenge of monocultural classrooms and help students to build on their own knowledge and understanding of cross-cultural communication challenges. The outsider/insider assignment "simultaneously teaches facts about cultural difference and skills for managing cross-cultural encounters (Garcia, 2014, p.453)". Havis (2020) also highlighted the importance of a reflective component in the outsider/insider assignment.

Teaching practices (TP)

This section addresses the issue of the Foundation of TP in general and the teacher strategy relevant to this research and practical understanding by the authors.

Foundation of TP

Effective learning and teaching begins from the foundation of a good curriculum, where learning outcomes, assessment and feedback are all aligned. The overall experience can be improved dramatically, however, by equipping students with the skills and literacies necessary for successful learning, and lecturers or facilitators with the knowledge, skills and methods for developing engaging teaching by means of outstanding lectures and authentic assessments.

In this section of the paper, we will discuss these aspects of teaching practices:

- **An inclusive curriculum**: A range of tools and approaches to help lecturers to embed equality, diversity and inclusivity into the curriculum.
- **Effective teaching strategies**: Continually developing approaches to teaching can be a rewarding experience. This section provides opportunities for lecturers to think creatively about their teaching practice.
- **Personal tutoring**:
  Helping lecturers to identify strategies and approaches to become more effective as a personal tutor.

The outstanding lecture enhances TP

According to Morton (2007) and Race (2007), an outstanding lecture and assessments contain the following attributes:

- It is delivered in a way that is informative, interesting and engaging.
- The content is well organised and easy to follow.
- Students can understand the development of the argument, or the logic in the ordering of the information or ideas.
- Students feel involved. This may be through some type of active participation, use of relevant examples to which they can relate and by being made to think about what is being said.
- The ability to engage students through questioning, no matter what the class size, is an important way of getting students involved.

Teacher Strategy Relevant to This Research

The outsider/insider assignment is a teaching strategy to simultaneously teach facts about cultural difference and skills for managing cross-cultural encounters in communication. A lecturer at a mainly monocultural university in South Africa developed an adapted outsider/insider assignment for a first year Business Communication course. The aim of this paper is to firstly report on the application of the adapted assignment applied in the Economic and Management field. Secondly, the researcher will report on the effect hereof on student learning.

Description of the project

In response to the above-mentioned challenges, a lecturer at a mainly monocultural university in South Africa developed an adapted outsider/insider assignment for a first year Business Communication course to teach cross-cultural communication. The aim of this paper is to firstly report on the application of the two components (outsider/insider assignment and the ORID method) applied in the Economic and Management field. Secondly, the researcher will report on the effect hereof on student learning.

The assignment

Business communication students participated in an individual assignment adapted from the original outsider/insider assignment of which ninety-nine gave permission to analyse the content of the assignments. The assignment was divided into five parts. Firstly, students had to do academic research on cross-cultural communication and the understanding thereof. The aim of this first section was to equip students with relevant knowledge and develop their academic research skills. The second part of the assignment students had to write two paragraphs (of 200-400 words in total) about a situation or time in their life where they were an outsider because of their culture. Like in the second part, students had to reflect on a time that they were an insider based on their culture in part three. A set of questions were asked about these outsider and insider situations, like how it made you feel, what did you learn from other cultures, explain the challenges experienced during each situation. Erin Meyer (2014), Professor at INSEAD and author of the book: "The Culture Map", identifies a systematic approach to decoding the cultural differences in your work and applying strategies to bridge these cultural differences. In part four of the assignment students had to study Erin Meyer's culture mapping and determine if the low and high context communication had an influence in their outsider/insider situation.

The final part of the assignment (five) incorporated a reflective component based on the ORID method. Spencer (1989) developed the ORID (objective, reflective, interpretive and decisional) method, which is grounded in the Kolb Experiential Learning Model (Kolb, 1984). Students had to reflect on the assignment and how this can influence their communication skills in the business world.

Methodology

One hundred and nineteen Business Communication students participated in an individual assignment adapted from the original outsider/insider assignment of which ninety-nine gave permission to analyse the content of the assignments. Plowright's Framework for an Integrated Methodology (FraIM) (2016) was used to allow an empirical exploration of the assignment activities and reflective feedback of students through artefact analysis.

Three of the 99 participants did not complete the five sets of reflections questions (Table 1). Results will be discussed on all 99.

Table 1

Set of ORID-reflection questions

ORID-acronym	**Questions asked at the end of the assessment**
Objective	What do you think was the purpose of this assignment? Did you achieve the goal through your actions / assignment that you submitted?
Reflective—Connected to Affective Experience	How did the experience make you feel? Has your anxiety changed or is your self-confidence growing? Did you feel effective and knowledgeable? Why? Or why not?
Interpretive—Refers to cognitive experience	What did this experience make you think about? How has it changed your thinking? What did you learn? What worked / did not work and why / why not?
Decisional –Refers to the ability to include experiences	What will you do differently next time? What decisions or opinions did you form? How will the experience affect your career path? How will you use this new information, new skills, or new knowledge?

ORID-acronym	Questions asked at the end of the assessment
Reflecting on Reflection	What do you think of reflection, is it important or not? Do you think the use of the ORID method of reflection influenced what you learned in this assignment? Why or why not? Do you think it is important to reflect or do you see it as a waste of time? Why or why not? Do you like to reflect on your life in general? Why or why not?

Research Findings

Objective of assignment (O of ORID)

The aim of the Outsider/Insider assignment simultaneously teaches facts about cultural difference and skills for managing cross-cultural encounters.

Table 2

Summary of students that have participated in the Outsider/Insider assignment

Do students show full understanding of the aim of the Outsider/Insider assignment?	Number
Yes	81
No	3
Some	12
No response	3

The overall understanding of the aim of the Outsider/Insider was good (See table 2). According to Garcia (2014) the aim of the Outsider/Insider assignment simultaneously teaches facts about cultural difference and skills for managing cross-cultural encounters. Most of the students (81.8%) explained the aim in line with Garcia's explanation. Three (3) of the students did not show any understanding of the aim of the assessment, while three others did not complete the reflection. Twelve of the students only referred to the importance of communication, but not the real issue of intercultural differences and communication.

> *Participant 43*: I believe that the aim of this assignment was not only to assist me to do self-discovery to find effective solutions in my everyday life and to improve my professional communication, but also to better understand that different people in the world have different backgrounds and communication is very complex. It is important to be sensitive towards these factors.

> *Participant 88*: I think the aim of the assignment was to assist me to create an overall view of how intercultural communication work, why is important to effectively communication with other culture groups.

Reflective (R of ORID)

Thirty six (44%) of the 81 students that identified the aim of the assignment correctly, mentioned the increase in their self-esteem during the reflective phase of the ORID questions.

> *Participant 87* explained that knowing now how to better operate in future situations where cross cultural communication is involved increased self-esteem in the workplace.

Twenty-five (30%) mentioned expressed good and positive feelings during the course of the assignment due to better understanding of their own culture, as well as the culture of others.

Nineteen (23%) of the students express negative feelings of incompetency and fear, as this assignment required new skills, like written communication skills, research skills and applying theoretical concepts to everyday life situations.

> *Participant 2*: I felt frustrated due to lack of research skills and hopeless at times.

> *Participant 73*: In the beginning I was skeptical and stressed about this assignment, but the more I understood, the more comfortable I got, the more I gained self-esteem. I felt more effective and knowledgeable as the time went on.

> *Participant 78*: As a young twenty-year-old, I have very little experience of intercultural interactions in the workplace, therefore I felt anxious at times. As I work through the assignment my self-esteem started to grow. There were times that I felt more knowledgeable and other times a lot less knowledgeable.

Interpretive (I of ORID)

The main theme for the reflection on the interpretive questions were the value of knowing your own culture but also knowing and respecting others culture. Fifteen students mentioned how the experience made them realise that they can be proud of their own culture but still have respect for other's culture.

> *Participant 6*: Show respect to others and get to know someone to understand if their goals and values are the same than yours.

The absolute importance of good communication in intercultural interactions were highlighted.

> *Participant 5*: Communication is the bridge between different cultures

Decisional (D of ORID):
Erin Meyer's culture mapping was a good guideline for students. The understanding of high and low context communication assist students to understand communication better, but also to recognize the importance of good scientific research during any encounter with other cultures.

> *Participant 4*: I have learnt so much during this assignment, especially with Erin Meyer's culture mapping, and I see intercultural communication now in a different light, which made this a very positive experience.

Forty-nine (60%) of the students mentioned how in the future they would do research on other cultures before or during encounters with them.

> *Participant 49*: Next time I would do thorough research and preparation before I have encounters with other cultures with Erin Meyer's culture mapping as background.

While another participant concluded the influence that the experience had on their understanding of cultural differences.

> *Participant 60*: This experience gave me insight and new knowledge on culture differences.

Reflection on Reflection
Students finally reflected on their own reflection, as well as the aim of the reflection. All eighty-one (100%) students mentioned that they believe reflection is very important.

> *Participant 2*: Without this reflection I would not have known what to do with the knowledge that I have gain from this assignment.

> *Participant 14*: It is important to reflect, without this reflection I would not have think about how I can apply this new knowledge in my life.

Thirty-seven (45%) of the students express the value of specifically the ORID method.

> *Participant 19*: The ORID method helped me to keep the aim of the assessment in mind and to reflect the whole time while I am busy with the assignment.

> *Participant 20*: Due to our fast lifestyle and relatively very little time we are constantly in a hurry. I benefit a lot from this reflection. The ORID method made me realise how important if it to convert knowledge to competencies which can be apply in all facets of life.

> *Participant 34*: I like the ORID method. When I answered the questions, I had exact things from the assignment that I could rethink.

One student had a different viewpoint in terms of the functionality of ORID.

> *Participant 23*: ORID did not teach me something new, it made me reflect on what I already knew.

Findings and conclusion

The findings indicate the value of both the outsider/insider assignment and the use of a reflection component based on the ORID-method. This effective teaching strategy can contribute to assessment practices of an educator in communication at higher education institutions and provide an example of a strategy with evidence of student learning. Students showed a good understanding of the aim of the assignment. Students identified relevant actions that were rooted in their new knowledge. Students also showed appreciation of their own, as well as other's cultures, which was not an easy TP to apply in a monocultural classroom. Lastly, students showed an appreciation for the ORID reflection method, as well as reflective practices, also a TP that lecturers can use to further enhance student learning.

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DECISION-MAKING TOOL: AUTOMATING ICT INTEGRATION IN THE CHILEAN CLASSROOM

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Abstract

As a consequence of the COVID-19 pandemic, Chilean schools had to resort to the use of ICT to provide continuity to the teaching-learning process through remote teaching without being prepared. Finding a solution that supports and helps teachers, who don't know how to integrate ICT to their class, we developed the Generic Model of Integration of the Pedagogical Use of Technologies to re-design classes using ICT, using the "decision tree" method. After initial testing with 122 teachers, we observed that users rated the platform positively for its user-friendly design and its capacity to systematize and suggest digital resources.

Introduction

When the pandemic started, a great number of Latin American countries already counted with initiatives to provide an infrastructure of resources and digital platforms. However, despite the significant efforts, very few possessed a national strategy that allowed them to take advantage of ICT (Álvarez Marinelli et al., 2020). For this reason, when the sanitary emergency due to COVID-19 came into view, schools had to fall back into different remote strategies to give some continuity to the teaching-learning process in a distanced context, among them remote lessons (Sepulveda-Escobar & Morrison, 2020), despite the lack of or limited preparation that most educational establishments had to confront the situation by the use of ICT (Bahamondes Rivera & Abarca Millán, 2021).

An example that illustrated this situation was the Chilean case. Despite the country having started—for a few decades now—different educational policies to promote the access to technology for schoolchildren, as well as developing skills for the use of said technologies (Claro, 2010), during the pandemic, it was demonstrated that Chilean schools were not sufficiently prepared to work by integrating digital resources (Murillo & Duk, 2020).
Under these conditions, in Chile, the integration of ICT to the teaching-learning process has been limited when it comes to the frequency of its use, as well as variety (Ibieta et.al, 2017; Álvarez Marinelli et al., 2020). Therefore, attempting to confront

this situation and faced with a sanitary crisis that meant the closure of all educational establishments, the Government and different NGOs have developed supporting material—both synchronous and asynchronous- and implemented connection plans (Comisión Económica para América Latina y el Caribe (CEPAL) & la Oficina Regional de Educación para América Latina y el Caribe de la Organización de las Naciones Unidas para la Educación, la Ciencia y la Cultura (OREALC/UNESCO Santiago), 2020). However, despite the contributions that this has implied, as these measures were focused on resources and learning to use ICT (for example: training teachers in the use of Classroom, Zoom, Google Drive, etc.), there remains a need for developing solutions that help the educators, on the one hand, to diversify their use of ICT beyond their basic use as communications technologies, and, on the other, to select technological tools as a pedagogical decision within their lessons planning.

Taking this into account, the objective of this project is to develop a model that proposes to be a framework for an educational digital platform (Ed-Tech), which has the aim to support teachers in their lesson planning that require the use of digital resources. As this is a complex process –greatly related to the development of learning (Justman & Mais, 1956)– it creates a high number of benefits for the students. For instance, it allows capturing the students' attention, changing their negative attitudes towards the content, and reinforcing their participation in achieving the learning goals (Medrano Hernández & Orozco López, 2021).

In the same way, planning can "help [educators] to develop abilities to select, structure and organize lesson content into effective support for learning" (Richards & Bohlke, 2011, p. 42). These skills, that are more than necessary today, are products of an environment that demands and pressures teachers to adapt—constantly—to different situations, multiple changes in contents and new resources, which they haven't necessarily been prepared to manage.

Throughout this proposal, we will present the results from the first testing phase of the technological solution framed within the development of the "Generic Model of Integration of the Pedagogical Use of Technologies" (GMIPUT), for its use by teachers. This educational digital platform is built under a logic of resource selection based in a pedagogical decision, not at random, with the objective of promoting the achievement of learning goals, as well as motivation and involvement of students in the class.

Theoretical framework

Understanding that planning plays a key role when it comes to integrating technologies to achieve proposed learning goals, and discovering what this process entails, is presented as a need to be able to implement solutions starting from this action orientation. In this respect, Medrano Hernández & Orozco López, (2021) propose that this process–represented through a design—requires a diagnostic as a starting point. Independently from the type of planning used, knowing the conditions of the school community, its strengths and weaknesses, allows us to formulate a more efficient design (Furguerle Rangel et al., 2016) according to both the capabilities and needs of teachers and students. For this reason, diagnosing factors linked to performance—such as values, attitudes, motivations, and, most importantly, competences—allows for better insertion and integration of elements present in the learning and teaching process (Sobrado Fernández, 2005).

Among these factors, we highlight the role of motivational beliefs, which mobilize and guide the feelings and actions of the students, as a referential framework (Ongowo & Hungi, 2014). This is because, in a context where technologies are already a part of everyday life for most of the school population, for their use to be effective and efficient—together with self-regulation strategies (Kampylis et al., 2015)—it is required that its users—understood as students and teachers—conduct their actions towards the integration of these new resources; that is, that they feel motivated to use these tools from the beginning (Backfisch et al., 2020).
Alongside the motivational beliefs, another indispensable element is the technological infrastructure (Zhu & Liu, 2020). Specifically, for the educational ambit, digital resources imply applications, software, programs, or websites that involve the students in learning activities and support learning goals (U.S. Department of Education, 2018), as well as the hardware or the necessary infrastructure to utilize these digital resources (for example: computers, tablets, among others). Connectivity, on the other hand, refers to the availability of quality Internet that allows students to access relevant materials to continue their studies and academic achievements (Islam & Grönlund, 2016).

Finally, for the development of educational diagnostics, it is necessary to take into account the skills the educational community possesses for the efficient use of ICT; as well as developing in teachers the ability to use ICT (From, 2017) so they can be useful in the motivation and learning process (Njoku, 2015).While there is no consensus in the literature about the definition of digital skills, for the scope of this project, we will understand "digital skill" and the capacity of utilizing and applying information technologies to solve an everyday problem (Richardson & Bisell,

2019), while digital skills oriented towards teaching are understood as "the ability to consistently apply the attitudes, knowledge and skills required to plan and conduct, and to evaluate and revise on an ongoing basis, ICT-supported teaching" (From, 2017, p.43).

Knowing in a general capacity these three elements (Motivations, Digital Infrastructure, Skills) allows the teacher, on the one hand, to have a better clarity regarding their needs. And, on the other hand, are background information that allows the teacher to take contextualized decisions. That is to say, the definitive selection of teaching strategies and/or digital resources are closer to their pedagogical needs, teaching style, and "technological" context of their educational community.

Bloom's Taxonomy

The former is the first step to consider for an effective integration of technologies, since, for it to really happen, according to Wang and Woo (2007), it is necessary—in addition—that one has clarity regarding why and for what these resources are being used or will be used. The successful use of ICT in the classroom requires an integration of the technologies and pedagogical processes that is well thought out during the preparation for the class, which requires support, since this process of developing technological-pedagogical knowledge does not occur automatically (Janssen et al., 2019).

In order to achieve this, Bloom's Taxonomy is not only key as a planning tool in every thematic area (Jideani & Jideani, 2012), but it can also be considered as a didactic tool for the implementation of technologies in the teaching-learning process (Netolicka & Simonova, 2017). It allows classifying different levels of cognitive complexity, from lower order thought skills (such as remembering), to higher order thought skills (such as creating).

In addition, in the last few years, this Taxonomy has been adapted to incorporate new activities as a product of technological development, recognizing within this taxonomy verbs that can lead the learning process in a digital environment (Churches, 2007). This last version has been nurtured with different activities, questions, methods, and tools that accompany each of Bloom's initial six categories (Remembering, Understanding, Applying, Analysing, Evaluating, Creating) with the objective of developing and broadening the different thought skills established by Bloom (1956).

Teaching strategies

Together with this, for a successful integration of technologies in planning—and for it to achieve learning goals—it is necessary to have educational strategies. According to Quijada (2011), teaching strategies can be understood as the procedures utilized by teachers to make learning possible. Therefore, Avanzini (2004) understands them as the path to follow to accomplish didactic processes in the best way possible; that is to say, a guide for action, in the sense that they orient the obtaining of certain results.

While there are diverse manners to classify these strategies (Honey & Mumford, 2002; Johnston, 2006), in the present paper we will work with the following categories: Strategies centred in the individualization of teaching (Individualization), understood as the techniques in which the teacher establishes a direct relationship with the student, assigning activities for their own self-realization, and with the required level of difficulty; strategies for group teaching, centred in the presentation of information and collaboration (Lecture), understood as expositive strategies that imply group participation, that is to say, communication from one to the group; and finally, strategies centred in collaborative work (Teamwork), defined as the techniques that imply communication among several individuals. Contrary to the previous technique, this one proposes to construct knowledge as a group employing communication (Delgado & Solano, 2009).

Digital Resources

For all of these strategies to help in achieving learning goals, they must be accompanied by resources. These resources function as stimuli that motivate and capture the student's attention for the achieving of a learning goal (Feo, 2010). In the case of ICT tools, their selection will be appropriate when considering their value in relation to the achieving of learning objectives (if not, their use can have negative effects on the learning process). Because the success of technological integration for learning does not only depend on their availability, but also on pedagogic design, they must be considered in accordance with a well-based and strategic planning—including, for instance, problems, learning objectives, required level of technologies and resources, and evaluation from students, among others (Wang & Woo, 2007).

As mentioned above, counting with access to resources does not ensure that the teachers are able to integrate them into their planning in a way that is both efficient and correct. Concretely, a process must happen in which teachers are able to perceive the usefulness of said resources, as well as their logic for being used. In the same way, these professionals must develop a positive attitude towards technology

(Ajzen 2012), because if this does not happen, an efficient adoption will not occur. Therefore, when thinking and developing a technological solution that attempts to support the work of a teacher in the integration of ICT, one cannot only consider the availability of said resources, but also the presence, among others, of elements that facilitate instances of teaching and support teachers considering motivational aspects in the integration of ICT (Backfisch et al., 2020).This can be achieved through the use of a platform that facilitates a simple use experience, links technology and pedagogy, and is sufficiently flexible for different contexts, necessities and realities in which school communities develop.

Methodology

The objective of this research project is to develop an educational technology that supports teachers in the planning of lessons that require the use of digital resources, both to achieve learning objectives and to sustain motivation and involvement from students in remote learning. Therefore, we are developing under the constructivist paradigm and utilizing a mixed focus of semi-experimental approach (Fernández, et.al., 2007), a "Generic Model of Integration of Pedagogical Use of Technologies", which includes contextual, pedagogical, and technological elements to ease the redesign of classes through the use of ICT.

The main objective for the construction of this model is to create a framework for a technological solution that supports teachers in the design of their classes that require the use of digital resources, both for achieving learning goals and to maintain the motivation of their students in remote learning. To make this technological solution concrete, a prototype for a Beta version of this digital platform was created with a survey software, which, by having a logic of skipping questions, allowed us to systematize and organize the information, with the objective of facilitating decision-taking regarding the integration of ICT tools with pedagogical purposes.

For this project, we structured and automatized the selection and integration of 77 free, easy to use digital resources, in Spanish, through the "decision tree" method. This took into account 20 alternatives of teaching strategies, which were articulated in relation to activities with individual, expositive, and collaborative characters. In the same way, the process—in turn—was organized around Bloom's Taxonomy, a framework widely accepted and used by the Chilean educational community for its versatility.

Finally, in this phase of the research project, we did a test of the tool through four instances of training, reaching a total of 122 teachers from 7th grade (elementary school) to 3rd year of high school in different Chilean schools. These training sessions were done in an asynchronous first module, with a defined time frame, where

the teachers used the educational digital platform and integrated a digital resource to their lesson planning. After, in the second module, they were set in groups of four to six teachers, and through a focus group, an instance led by a monitor from our team, they were asked to evaluate the usability, usefulness, and pedagogic appropriateness of the tool for their work as teachers.

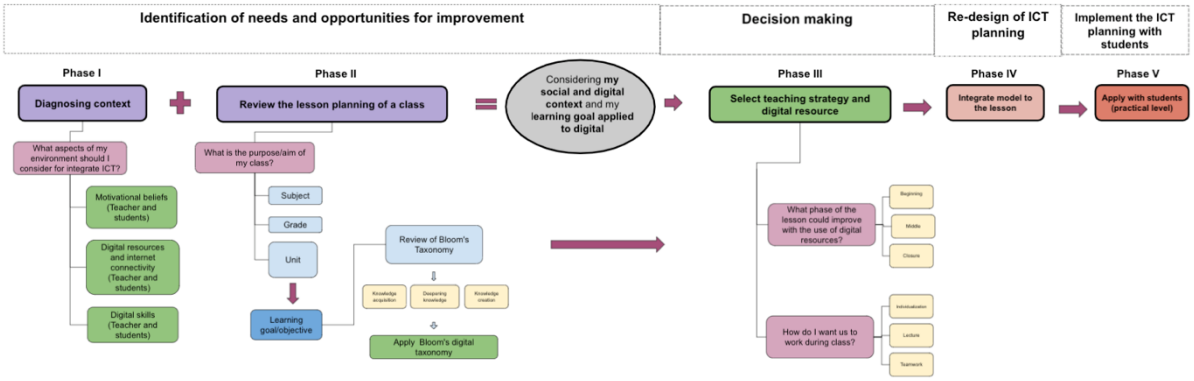
Results

Model presentation

Under the frame of the Fondecyt project "Risks and opportunities for the use of ICT in schoolchildren: towards an agenda of digital literacy for the 2020 student"(Halpern & Valenzuela, 2018), we develop the "Generic Model of Integration of Pedagogical Use of Technologies" (GMIPUT). Concretely, the model is made of 5 stages, which include processes of diagnosis and formation, such as the work with students. Stages 1, 2, and 3 of the Model were included in a Beta version of the digital platform, which through "decision tree" logic allows us to systematize and automatize the following information.

Figure 1

Generic Model of integration of the Pedagogical Use of Technologies



Phase I of the model consists of diagnosing the context in which the teachers work. For its development, we considered elements such as motivation, availability of resources and connectivity, and digital skills, both in students and teachers. For each of the reviewed concepts, there is a brief self-perception test in the platform, with which the teachers evaluate themselves and their students with regard to their situation and level (Low, Medium, High).

After creating a diagnostic, Phase **II of the model** consists of reviewing the lesson planning for a course and grade previously selected, to identify the learning

objective of one (or more) classes in a specific thematic unit that one wants to be realized with the use of ICT. The teacher, based on Bloom's Taxonomy, must identify the general category to which the previously selected learning objective belongs (Remembering, Understanding, Applying, Analysing, Evaluating, Creating). After this selection, the technological solution proposed deploys a series of alternative objectives linked to the main Bloom category selected, but this time oriented to their application in the digital world.

Once teachers have selected their learning objectives (in relation to Bloom's Taxonomy applied to the digital world), **Phase III of the model** contemplates the selection of teaching strategies and digital resources. For this, they are presented with a series of consecutive options that are related to: selection of the type of teaching strategy (that is to say, if they want to do an activity that focuses on the Individual, Teamwork, or Mixed); and the moment of the class (understood as the temporal space: Beginning, Middle, or Closure) in which they intend to apply a teaching strategy linked to digital resources. Having selected the teaching strategy and the moment of the class, they are presented with 3 digital resource options as a result, related to their previously designed decisions. These three alternative resources to be integrated into their planning are grouped according to technical requirements and ease of use, by levels: High, Medium, and Low, this with the objective that the teacher may take that last decision with freedom and based on the contextual background automatically received after completing the first stage of the model. In this way, teachers, through a dynamic set of questions and answers, can access a selection of digital resources recommended in relation to their previously indicated learning objectives.

Phase IV of the model corresponds to the re-design of their lesson plans. In this stage, more practical than before, they contemplate about using the GMIPUT. This means that, after working in the educational digital platform, they individually select the teaching strategy and/or definitive digital resource that they feel is more relevant to their context to achieve their learning goal, and they integrate it into their class plan.

Finally, **Phase V of the model** consists in the application of the work realized in the previous stages with their students. For this, and in terms of the project, we hope to apply an evaluation, both for teachers and students—before, during, and after—about the realization of the lesson plan, with the objective of observing perceptions and impact that this may have in the teaching and learning process.

Results obtained from testing in the second stage

After a first testing phase with 122 teachers in Chilean schools from different regions in the country, with the objective of observing the first impressions of the model and the educational digital platform, it was possible to identify the following findings. To begin with, the participants positively valued the usability of the platform, mainly for its user-friendly design. Specifically, the teachers highlighted how the information was organized and the ease of accessing it. The automation of results not only allowed them to save time, but it also helped to formalize their choice around specific options related to their pedagogical needs and interests. In addition, the teachers appreciated the ease with which the tool could be used and how useful it was to learn about the use of ICT as an objective to reach a proposed goal. Several quotes from teachers will be bulleted below.

- *"Perfect for reflexion and learning by teachers on how to use ICTs as tools to reach a proposed objective."* (Teacher, training 1)

On the other hand, its usefulness in designing and improving lesson plans was also highlighted by systematizing and presenting digital resources organized by learning goals in one single technological solution. From the described experiences, teachers shared that they knew about the different platforms that existed to improve their classes with ICT, but because there were so many, they felt overwhelmed by the amount of information. For this reason, the proposed tool appeared to them as a useful tool, because it organized resources in accordance to strategies that responded to Bloom's Taxonomy (a familiar framework that is widely used by Chilean teachers).

According to teachers, thanks to this systematization, it was easier to see the usefulness of the resources in their plans, and how they could use them without having to alter the planning that was already done. For this reason, it was widely well-received because of the situation of educational establishments in the country, which has implemented in person and virtual classes in an intermittent manner throughout the last school year, and therefore, necessitated the constant re-planning of activities by the teachers.

- *"Without a doubt, it is a contribution that tries to systematize disperse information to put it in service of education."* (Teacher, training 3)

Lastly, during testing instances, teachers identified new needs, such as, having a more precise systematization in relation to students' ages, available devices, and time for the activity. Based on this feedback from teachers, we plan to transform

this platform into a digital space of motivation and support that integrates the pedagogical and motivational needs of teachers and students, but also that constitutes itself as a collaborative space, allowing for the tool to sustain itself in time from the input, feedback, and experiences of the teachers themselves.

Discussion and Conclusions

Despite the important efforts that have been made to create some sort of digital content available to the students in respond to the sanitary emergency due to COVID-19 and the subsequent temporary closure of education centres (Álvarez Marinelli et al., 2020), the lack of orienting strategies to integrate ICTs, both inside and outside the classroom, with the proper training of teachers and students has made it difficult to adapt the dynamics and delivery of content in this new context (Bahamondes Rivera & Abarca Millán, 2021), since many teachers did not have any idea how to transform their existing teaching process to online learning (Rahiem, 2020).

This has all given rise to the need to collaborate in solutions that help the teachers' labor, with proposals that align themselves to policies, plans, and programs that use technologies (Cabello & Claro, 2017). In this sense, the "Generic Model of Integration of the Pedagogical Use of Technologies" presents itself as a technological solution that searches to support the development of lesson plans, so by integrating ICT—with pedagogical ends—they can contribute to the development of environments that propitiate learning (Martin et al., 2012), influence the performance of students (Feng & Li, 2016), promote motivation and generate commitment with the content being taught (Kolb, 2017).

At this moment, with the first phase of testing of the second stage of the model in 122 Chilean teachers, we can observe that the teachers positively value the usability of the platform, highlighting the way in which the information was systematized and organized, since it allowed them to select resources around their pedagogical and contextual needs, reducing the time spent in planning and contributing with confidence to their professional performance.

In the same way, they highlighted its usefulness to design and improve lesson plans around a theoretical framework that they already knew and made sense to them. For teachers who participated in this testing, the fact that Bloom's Taxonomy was used as the axis for the systematization was the most appreciated element. This is because this taxonomy is what organizes the Chilean school curriculum; therefore, the link that the teachers made between digital resources and their usefulness was faster. This not only lowered the entry barriers for the more reticent teachers when

it came to ICT integration, but also motivated—in a higher degree—the teachers who were more open to their use and integration.

In this sense, we can conclude that the proposed model, being sufficiently flexible to adapt itself to different pedagogical needs and contexts (transforming itself into a potential tool to consult when planning academic activities), would help to facilitate the integration of the use of ICT with pedagogical purposes, decreasing the entry barriers that many times are present at the time of wanting to integrate digital resources to the class (motivation, usefulness, self-efficacy, among others). In the same way, by helping teachers to select strategies and resources linked to their learning objectives (in a simple and automatized manner), it allows teachers to reduce the time required to develop and implement a lesson plan with activities that integrate ICT (Pittman & Gaines, 2015).

Finally, and considering that there are different factors that influence the use of ICT in the classroom—for instance, the availability of computational equipment, inclusion of technologies in the curriculum, and the policies of the educational community, among others—the project reinforces, from the teachers' feedback, that there is a need to approach the professional development of teachers regarding the use of ICT, beyond the giving of resources, infrastructure, and training to make operative use of these tools. Therefore, based on this proposal and taking into account the feedback from teachers, we want to transform the platform in a digital space that promotes collaborative work among teachers (Gil-Flores et al., 2017), with the objective of generating more confidence by learning from other close experiences and from their peers, allowing for the platform to sustain itself in time from the updated input and experience from the teachers themselves.

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RECOVERING FROM THE INITIAL SHOCK: STUDENTS ONLINE EDUCATIONAL EXPERIENCE

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Abstract

2020 was seen as a year of educational transformation across the globe. The shift from face-to-face to online mode grew exponentially due to the effects of the COVID-19 pandemic. An investigation into student's online educational experience using the Community of Inquiry (CoI) framework was conducted. Five hundred fifty six students completed an online survey consisting of Likert scale and open ended questions. A qualitative analysis with descriptive statistics reveals the role and impact of cognitive, social, and facilitator presence within the online module. The findings of this study provide insights into how adult learners experience the online learning environment.

Introduction

It is already well known that online learning grew at an unstoppable rate over the last few years (Dhawan, 2020). Statistics show that since 2000, the growth of the online learning industry has been 900% (Gutierrez, 2016). According to the World Economic Forum, this growth escalated during the COVID-19 outbreak, resulting in many online platforms making applications available for free (Li & Lalani, 2020). This shift to online learning is said to be foundational (Hamann et al., 2020) as online learning is no longer an option, but a necessity.

The COVID-19 pandemic saw the rise in the integration of Open Educational Resources (OER's) into online learning to supplement teaching and learning globally (Kim et al., 2020). The self-paced nature of these learning environments coupled with the advanced technology skills required came as a shock to many students, lecturers and training facilitators. Difficulties in sustaining engagement and factors of student perseverance resulted in low attrition rates, despite a growing number of online learning platforms to provide students with high quality study material at low cost (McShane, 2017).

In spite of the challenges, higher education institutions have been at the forefront of this fundamental change. The majority of students enrolled for online courses are a distinct educational population, as the older traditional student population with

full time jobs are increasingly enrolling into online courses. This strict divide in access to quality education is narrowing as education is becoming more flexible and accessible through available online technology. Online course material is now seen as mainstream (Hamann et al., 2020). Amongst all the chaos, online learning emerged as a victor ludorum.

It is to this end that the researchers decided to explore student experiences in fully online learning during COVID-19 in a South African higher education institution. The focus was largely on course design, student interaction and self-directed learning. The purpose of this study is to determine how adult students experience online learning and to recommend how the inclusion of these three focal elements can improve module design which impacts user experience. This leads to the research question "How do adult students initially experience online learning?"

Literature Review

Online learning is a term that is used often to include a wide range of information communication technologies and electronic media that can be used for educational purposes. Online learning is characterised as a flexible, accessible way of learning where interaction with the instructor is done virtually (Bates, 2016). The geographical and temporal barriers between students collapse and they have access to relevant learning material ubiquitously (Muljana & Luo, 2019). The synchronous and asynchronous options allow students to work at their own pace and communicate with peers and instructors, emphasizing the self-directed nature of online learning.

Online teaching and learning is seen as the answer for the COVID-19 educational crisis (Dhawan, 2020). Higher education institutions needed to move online as the outbreak of the global pandemic put most countries under lockdown. To transform all the face-to-face content to online overnight was impossible. If anything, this catastrophe showed the lucrative side to online teaching and learning. Even though institutions and teaching staff were initially reluctant to change and accept the use of modern technology, they scrambled different options of pedagogical approaches to aptly use the technology. According to Au, Li & Wong (2018) online learning courses must include study skills, time management, advisors to create a sense of belonging, short videos for engagement, student leaders or peer tutors and consistent reflection to be successful. During this time the main concern was whether online learning could provide quality education since there needed to be a complete shift in pedagogical approaches. As a result institutions came up with several support strategies and innovative solutions to help academics and students cope with the challenges of distance, scale and personalised teaching and learning (Dhawan,

2020). This required higher education institutions to reimagine education and source digital literacy guidance.

Many factors played a role in the success of online learning and therefore the design of these modules need to be emphasized (Dumulescu, Pop-Păcurar & Necula, 2021). Not only was the content and facilitation important, but also other aspects such as motivation, collaboration/cooperation with other students, social interactions with others and obviously computer literacy and Internet access. With many of the online learning programmes making use of virtual sessions, the telecommunications infrastructure also needed to be upgraded (Khan, 2021). This required time, slowing down the transition for both academic staff and students to continue with quality education in the online space. However, months into this pandemic, it is evident that the global transformation of education and pedagogical approaches is transcending and a new culture for online distance education has emerged (Astafeva, Astafiev, & Osipova, 2020).

Irrespective of the challenges, it has since become evident that adult learners persevere through the difficult times in order to upskill and develop themselves (Scarpetta & Quintini, 2020) professionally and academically (Martí-Parreñoa, Seguí-Masa & Seguí-Mas, 2016). This results in high enrolments in online courses at various institutions (Boston et al., 2009). The inability for students to self-regulate still remains the most significant barrier to online learning success (Shea et al., 2014). Over the last decade several online learning models have been developed such as Connectivism (Siemens, 2005), Online collaborative learning (Harasim, 2000), Community of Inquiry (Garrison, Anderson, & Archer, 2000) and the Multimodal model for online education (Picciano, 2017). While not the most recent, the Community of Inquiry (CoI) Framework is one of the most commonly used to guide the design of online courses. Proper course design leads to a positive learning experience which influences retention rates (Boston et al., 2009; Shea et al., 2014).

By implementing the three presences mentioned in the CoI framework in both blended and online environments students are encouraged to collectively solve problems even though they are separated by time and space (Swan, 2019). The three presences proposed by Garrison, Anderson and Archer, (2010): Cognitive presence, Social presence and Teaching presence are seen as the core elements for interaction in online courses. Students are provided with a triggering event such as a problem to solve, which sets them on the path of exploration, integration, and resolution (Fiock, 2020). This is seen as Cognitive presence where student's construct knowledge by thinking critically and reflecting. The expression of personal feelings and beliefs, interpersonal communication to build group cohesion and finally open

communication which encourages social interaction with peers, supporting each other in the online environment is seen as Social presence (Swan, 2019). Finally, teaching presence is characterised by the facilitator's choice of course design, organisation of learning events, learning facilitation and at times direct instruction, to direct students' online interactions towards the learning outcomes (Shea et al., 2014; Swan, 2019).

Methodology

Since this is the first fully online qualification at this university, this research study was exploratory (Davis, 2014) in nature and the design in line with a qualitative case study approach (Yin, 2009). Postgraduate adult students registered for a fully online postgraduate diploma at the school of health systems and public health. At the end of their first module, they completed an online survey that was embedded in the learning management system. In total, 556 students agreed to partake in the study and completed the online questionnaire. This questionnaire consisted of Likert scale and open ended questions. Descriptive statistics were used and supported by qualitative data gained from the open-ended questions. The open-ended questions gave the students a voice to share important aspects regarding their online experience that may not necessarily have been covered by the Likert scale questions. The benefit of these questions was to reveal experiences in all forms that the students had which were not known to the researchers.

The responses were inductively analysed against the CoI framework to form an understanding of how adult students experience online learning at the onset of COVID-19 at a predominantly contact university. Although the feedback mostly disputes or confirms the presences of the Community of Inquiry framework (Teacher-, cognitive-, and social presence) the researchers were interested in other aspects that also played a role in adult student experiences of online learning during the initial stages of the COVID-19 pandemic. In order to address the three presences and their overlapping elements i.e. climate setting, supporting discourse, and selecting content, the Likert scale questions were analysed by calculating the mean of the responses (total of the Strongly agree and Agree) in MS Excel. The mean was indicated as a percentage where 80% is used to indicate a positive experience. We chose 80%, because in academic terms, 80% is regarded as a distinction. From the open-ended questions, themes were identified and inductively analysed to identify more aspects that contribute to the student experience and which learning designers and facilitators need to take note of when designing fully online modules (Henning, van Rensburg & Smit, 2004). Online learning remains a new transformation to teaching and learning and reveals aspects that create an initial shock to students as they embark on this unfamiliar path to learning during stressful times.

Findings and Discussion

While the overall experience of the students was positive (mean 80% or higher), we were also interested in the less positive experience so that we could look for loop holes or gaps for areas of improvement. We then changed our focus to the questions where the mean was below 80% and then isolated three areas for further investigation. Facilitator support (part of the teacher presence of the CoI), group activities (contribute to learning), discussions and peer activities (communication) that forms part of the cognitive presence and social presence as it supports the discourse of learning and climate setting were identified. See Table 1 for examples of the related questions.

Table 1

Questions where less than 80% of the participants Strongly agree or Agree.

CoI Presence	Question	%
Teacher Presence	Whenever I had difficulties, the facilitator provided help during specified consulting hours.	78
Cognitive	I could easily manage the course workload.	70
Cognitive	The group activities contributed to my learning.	76
Social	I communicated with my peers about academic matters.	70
Social	I communicated with my peers about non-academic matters.	23
Cognitive	Group discussions contributed to my learning.	78

To further investigate this phenomenon, the researchers zoomed in on the open-ended questions, keeping "support", "group work", "discussions" and "peer activities" in mind. The responses also revealed the aspect of "workload" to play an integral part in online learning experience. From analysing the participant's responses in the open-ended question, researchers identified the following factors as the participants' greatest challenges.

Teacher Presence

It was evident that many participants felt lost during the first two weeks of the module. El Mansour and Mupinga (2007) agree that participants easily feel lost in cyberspace and this created a blindness for all the support that might be available. When a Facilitator does not respond immediately, the sense of loneliness increases.

This feeling of being lost is demonstrated in the response of P412 when they referred to the challenges of the module: "*In the 1st week not knowing what to do. A live online orientation was supposed to have been done to explain how the platform works*." Similarly, P430 mentioned "*Getting used to the Blackboard app. It took me a few days. I am good now.*" This emphasises the initial shock of not physically seeing a facilitator face-to-face in class in traditional teaching. The physical presence of a facilitator provides some form of comfort to a student whereas the absence in the online space provides some kind of discomfort. This is evident in the number of participants that request more virtual sessions.

Participants also needed additional support and clarity about the academic content and what was expected from them. In traditional teaching, participants are accustomed to listening to instructions from the facilitator and following them step-by-step. In the online space, instructions are given in the form of videos and written text. Participants then need to read the instructions and follow the steps on their own. However, these misconceived instructions were mostly linked to specific activities. For example, P541 indicated "*The instructions weren't clear enough at times, to some extent a bit confusing*" and later clarified that it was "*Especially when we had to do the one that spoke about transition.*" It is important to mention that this specific qualification is created for professionals interested in further study in Public Health, with no specific undergraduate qualification needed. So the level of experience and exposure to public health related terminology varies and was clear in the statement of P536: "*Because of my undergraduate Degree, the terminology used in PH was very challenging for me.*" This resulted in additional confusion when they had to work in an online environment, without face to face contact with the facilitator, working with concepts that they are not familiar with. Ignorance in seeking help or following instructions or just working through all the study material before attempting the activities was common and resulted in many participants being lost due to their own accord. P126 indicated that "*Instructions on clickup were confusing in the first week*", which creates an assumption that it improved while progressing through the other weeks.

It can therefore be assumed that the shock of receiving instructions in a different form posed a challenge and may have created some form of anxiety when completing tasks, as participants felt less confident in their ability to complete activities correctly and on time.

Social presence

Group work relates to both the cognitive and social presence in a module (Fiock, 2020). When students are actively brainstorming and discussing content, arguing

for and against a statement, it resides with the cognitive presence, while when they work collaboratively, to support each other, communicate on a personal level, it contributes to the social presence in the online classroom. Although more than 80% of the participants strongly agree or agree that the facilitator created an environment conducive for peer interactions, more than 20% of the participants were hesitant to agree whether group activities and group discussions contributed to their learning. P204 mentioned that "*Interacting in the group project was a challenge for me as I was still settling in on the module and taking more time with the readings, therefore, my contribution was delayed as compared to the other group members and communication was not easily obtained within the group*." Participants also found "*Discussions and work with fellow students on the course*" very challenging (P163).

Traditionally, group activities and group discussion are guided and scaffolded by the lecturer in a classroom. In the online environment the facilitator creates the opportunities for the group activity or discussions and participants are required to organise themselves, understand the instructions of the activity, divide the work, work coherently together, communicate openly and complete and submit the task on time. The initial shock of the responsibility on the student to make contact with peers that they have never seen or met discuss and collectively plan and complete activities creates discomfort and anxiety. The asynchronous nature of completing these group activities leads to frustration and further contributes to a negative online learning experience.

Cognitive presence

Surprisingly, many participants found that they lacked creative skills. Maybe it is because of the nature of the module where they have to find solutions and present it in the form of a brochure or poster or that they don't have the computer skills to do what they want to do. This is confirmed when P198 said "*being creative when it comes to creating posters and illustrations*" was their biggest challenge in the module, and P170 added that their biggest challenge was "*creativity that needed computer proficiency*".

However, others also referred to specific activities that challenged them on a cognitive level. For example P237 mentioned that "*I haven't yet mastered scientific writing, where one has to prove an argument with evidence and to remove myself from it (objective vs subjective). Finding the evidence itself proved to be a challenge.*" Not mentioning a specific activity, P185 said that "*Technical skills, fast critical and analytical thinking*" was a challenge and that it forced them to "*have a strong discipline and commitment to studying time after work*".

In the online space, multiple assessment opportunities were provided. In this specific module the participants had 33 assessment opportunities. It was interesting to find that participants still requested more assessment activities in the form of quizzes to be built-in to the module. This highlights the initial shock of a variety of assessment tasks, tools and strategies that were included into the module. Participants found these "new" assessment activities strange and unfamiliar when compared to traditional quizzes and tests.

Time Management and Workload

One of the major aspects that contributed to the initial shock of online learning was how participants experience time management. As others before them experienced (Au, Li & Wong (2018), for the first time learning was self-directed and self-paced but still within timeframes. This unfamiliar learning principle which previously is not so predominant in traditional learning was largely acknowledged and also posed to be a challenge initially. While credits predicted the notional hours, participants had a huge challenge to balance work, studies, and family life. Setting enough time aside to do the preparation, discussions, collaboration, and activities was a big challenge resulting in nearly half of the mentioned challenges related to time management, procrastination, workload, not meeting due dates, and balancing personal life, work and studies. This struggle of participants is evident in this quote of P479: "*Time management in the space of online learning. It took quite a while to build rhythm and find my feet in the world of online learning. Careful and committed planning is required to effectively participate in the module and maximise the learning experience*."

Although the above-mentioned information gave the researchers insight into the experience of the participants, as well as ideas of where and how to improve the module design, many of the challenges relate to personal skills and circumstances. Pregnancies, workload, COVID-19 related illness of participants and nearby family members, electricity, and Internet connection were frequently mentioned. In addition, participants lack computer skills and struggle with being responsible for their own studies. The participant's struggles are evident, as when P312 mentioned "*Time management was my biggest problem due to personal problems (death in the family 2x) it made life difficult*."

Conclusion

In this study it was clear that students were in shock when they started this fully online course. They were not ready to find various sources of support but waited for the facilitator to be available 24/7. Participants struggled to balance the responsibilities of part-time self-directed learning with their personal responsibilities and

career life. They also didn't experience the social presence and climate in the online environment as inviting and didn't even attempt to associate with their peers online. When forced to, since the activity counts for marks, students did participate in their group activities but did not benefit from them. This lack of interaction also hinders the success of group activities where their logistical struggles overpower the benefits of critically engaging with their peers, debate and creating a learning discourse.

However, all was not gloom and doom. Through the course of the module the participants reported that they started balancing their personal, study and career life, they did manage to find their way around the online environment, started using the additional resources and facilitator emergency room, and continued to email their facilitator. It can then be assumed that although students were in shock, they eventually overcame the shock and continued to excel in this online course.
Reflecting on the course design and how it impacted user experience, it can be said that the module was well designed to accommodate all three presences. Student responses reveal that their ability to adapt to a new mode of learning and different teaching strategies that are unfamiliar posed the greatest challenge. It is recommended that similar studies be conducted where the same cohort of students are asked to reflect on their experience of online learning at different stages of the programme. This will then reveal how students cope and adapt to change in education practice.

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TRANSITION FROM AN INSTRUCTOR-LED ENVIRONMENT TO SELF-DIRECTED ONLINE LEARNING: A SURVIVAL GUIDE DURING A PANDEMIC

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Abstract

At the end of 2019, a threat to normalcy hit the world. Nothing could have prepared anyone for the physical, emotional, or financial consequences of the COVID-19 pandemic. This paper describes the challenges at a South African university of technology. Overnight changes exposed the students' under-preparedness for online, self-directed learning. Lecturers, management, and infrastructure were not ready to address the demand for equal, remote access to learning. The purpose of this paper is to examine and apply principles of andragogy and self-directed learning to develop a guide for new students to ease them into online learning.

Introduction/Background

This paper shares the journey and observations of a Computational Mathematics lecturer (the first author of this paper) during a world-wide pandemic. At the time of writing the first author is a lecturer at a University of Technology in a rural, South African environment. South Africa's first, hard lockdown was announced on Monday 23 March 2020; it was initially planned to last three weeks, from 26 March until 16 April 2020.

Late April 2020, a five-level COVID-19 alert system was introduced in South Africa to "manage the gradual easing of the lockdown", with this risk-adjusted approach determining "the level of restrictions to be applied during the national state of disaster" (South African Government, 2020). For example, Level 1 indicates a low Covid-19 spread with a high health system readiness, whereas Level 5 indicates a high Covid-19 spread with a low health system readiness. In 2020, South Africa was on Level 4 from 1 May, Level 3 from 1 June, Level 2 from 15 August and Level 1 from 20 September (South African Government, 2020).

First-year students could only return to campus at the end of September 2020 for contact classes (after vacating campuses middle April). Contact classes for first-year students in the ICT Faculty resumed on 5 October and were concluded on 11

December 2020 for the Christmas (summer) break. Contact classes then started again on 4 January and ran until 5 March 2021. However, official communication indicated clearly that attending contact classes was voluntary, and those who preferred to stay home, could do so. Therefore, the implication was that the lecturers had to accommodate both contact and online students simultaneously.

The university allowed first-year students back for the 2021 academic year, which only started on 12 April. Because of social distancing and other lockdown regulations, only a limited number of venues are compliant with COVID-19 regulations, and the number of hours per subject was decreased from five to three per week. Registration for first-year students was also still open until middle June 2021, and therefore many students only started attending classes during the first week of June, causing new challenges for the new academic year.

The only constant at the start of the new (2021) academic year (while in the pandemic), was the fact that everything could again change if the President announced a higher, stricter level of lockdown again. Students were warned to be ready to go fully online at any given moment, using most of the contact time to teach them how to use the online resources and become self-directed, adult learners. The purpose of this paper is to learn from the experience and develop a guide for new students to ease them into online learning while supporting them to become self-directed, adult learners.

Methodology

"The main claim for the use of narrative in educational research is that humans are story-telling organisms who, individually and socially, lead storied lives. The study of narrative, therefore, is the study of the ways humans experience the world."

(Connelly & Clandinin, 1990)

The storytelling approach of this paper follows a narrative, interpretive methodology. The journey of the lecturer during the world-wide pandemic is the object of the study, focusing on how the lecturer, as well as her colleagues, students, and the institution, experienced and reacted to the extraordinary events brought on by the pandemic (Mitchell & Egudo, 2003).

Towards Self-directed, Adult Learning

Andragogy, the science of adult learning, has developed over the years, but it could be said that Lindeman's (1926) five key assumptions of adult learners formed the

basis on which others built their theories. From 1968 to 1984, Knowles then developed the theory of andragogy which built on five assumptions that should be made about adult learners (Knowles et al., 2005):

- Self-Concept: During adult's development their perception of themselves changes from being dependent on others toward being self-directed.
- Adult Learner Experience: As people mature, experiences become a resource for learning.
- Readiness to Learn: With maturity, a person's interest in learning develops according to their social roles and the skills they develop to function in the community.
- Orientation to Learning: As people mature, they would rather apply newly acquired knowledge than postpone the application thereof. Consequently, their approach to learning shifts from subject-centeredness to problem-centeredness.
- Motivation to Learn: Learning becomes an internal motivation.

Adult, self-directed learners are able to study independently. It is assumed that in general, adult, self-directed learners can employ methods and approaches that are necessary to accomplish learning successfully.

Although one would like to believe that first year students are adult students, personal experience shows that they still need a transition period coming from high school to university. They lack the necessary self-directed, adult learning skills. This lack of skills was highlighted during the pandemic as the students did not have the necessary time to transition from learner (school) to university student. The journey and observations described in the next section will highlight this statement. During lockdown, most of our students were waiting for on-campus, face-to-face contact sessions, and not working on their own, negatively affecting their chances to succeed.

The Journey and Observations: Switching to Online Learning

Challenge: Resource-deprived Environment

Under the impression they would return after three weeks of hard lockdown, the students were sent home for an extended recess on 15 March 2020, leaving behind their study material and other belongings. The students at this university are predominantly state-funded and from rural, low-income backgrounds with connectivity challenges. In addition to unreliable electricity and often dated mobile

devices, connectivity is hindered by the lack of internet access. The management and academics (lecturers) of the university were faced with an unimaginable scenario. The challenge was to accommodate students who did not have the appropriate resources to proceed online or not proceed at all.

Students, with limited resources, were therefore spread over the country, many of them in deep rural areas with little or no infrastructure. A Communique published by the university on 29 May 2020, acknowledged the students' challenges pertaining to devices, poor connectivity, and cost of mobile data. The University developed a plan, considering the complexities of the situation and the challenges of students, by switching to a "remote multimodal mode". The "remote multimodal mode" involved both online and paper-based learning. During a survey, to which 44,695 students responded, 97% indicated that they would require a laptop loan. Of the students who responded, 22% indicated that they had their own laptops. The results also indicated that 72% of the students required physical delivery of course material.

Faculties then requested subject coordinators to assemble "study packs" that had to be printed and couriered to students at great expense. Students were then informed by text to either expect a delivery, or to pick up their material from collection centres. The project was doomed to failure from the start because many students' phone numbers were incorrect on the university's system and consequently, thousands of students never received their text messages and therefore did not pick up their packages.

Students also received 30 GB of mobile data per month from the university to enable those with access to a mobile network to proceed with their studies. However, lecturers in the Faculty of ICT were not allowed to schedule any assessments or online contact for months. Demands by students for equality and access to the internet hindered learning, and both those with, and those without, access were negatively impacted by the restrictions on communication.

In the meanwhile, lecturers scrambled to transition from 100% face-to-face teaching to 100% online teaching on Blackboard™ Learning Management System (LMS). Most lecturers were unprepared and under severe pressure to develop resources without sufficient knowledge, technical support, and technology.

The truth is that "managing time to experiment with new technologies and balancing home related chores along with completing work related tasks leads to a different attitude towards this mode of education; teachers [lecturers] are already

overwhelmed with work" (Saboowala & Mishra, 2020). Most lecturers therefore opted to convert slideshows to videos, the brave ones made videos using smartphones, and others repurposed existing YouTube™ videos. Printed materials were uploaded to the LMS to provide students with access to course materials they might have lost or left on campus.

The university also rolled out mobile routers and mobile data for lecturers who requested it. However, the service provider could not cover all the areas where lecturers were working from home. It literally meant that some lecturers did nothing while "working from home" was the only option because of lockdown regulations. The workload on the rest of the lecturers became unbearable at times.

Once the communication restrictions were lifted, synchronous, online classes with Blackboard Collaborate Ultra™ were conducted (and recorded), but attendance was low due to poor connectivity and the lack of appropriate devices. Several lecturers opted for using WhatsApp™ groups for teaching and/or communication although it was not the official channel of communication.

Challenge: Demands of Online Development

As the subject coordinator for the subject, and with the help of colleagues in the subject team, my team developed the following to prepare the students for the Final Summative Assessment (examination):

- The notes (developed by the lecturers), covering the entire curriculum, were uploaded on the LMS. The notes included links to videos (QR codes and URLs), theory, explanations, examples, and activities.
    - Worked-out solutions to all the activities in the notes were developed and uploaded on the LMS.
- Once the communication restrictions were lifted by the faculty, the subject coordinator deployed a 10-day "Boot camp" on the LMS to guide the students to revise the two (pre-lockdown) chapters before attempting new content. The "Boot camp" consisted of daily worksheets (of which solutions were made available on the next day) and a quiz per worksheet.
- Two synchronous Question and Answer (Q&A) sessions per week were virtually hosted and recorded. Student were requested to e-mail their questions beforehand so that lectures could address problem areas. These sessions were extremely valuable as students mentioned problem areas which the lecturer have not even considered as problematic.

- All the formative assessments for the whole semester were adapted for the online environment and uploaded on the LMS. This included creating question banks, randomized quizzes, and an online assignment for which the content was assessed in an online quiz.
- At the end of the academic year (March/April 2021), the students wrote an invigilated, sit-down examination on campus which contributed 40% towards their final mark.

In the months before February 2021, the lecturer's greatest challenge as subject coordinator was keeping the team motivated to participate in the tasks allocated to them. The tasks referred to were mostly related to the development of addition online materials. The harsh reality during these stressful times was that not all team members participated, and often even ignored requests to produce resources.

Another challenge is that the university has switched to a new LMS at the beginning of the new academic year (2021), namely Brightspace D2L™. Lecturers were pushed into the deep end (again) to migrate, adjust, and update previous content to the new LMS while teaching face-to-face.

Challenge: First-year students

The new, first-year students were not afforded the time to develop and transition from instructor-led, face-to-face teaching to adult, self-directed learners before the lockdown started. In Knowles' view, self-directed learning is when an individual takes the initiative to assess their own needs, set goals, and find appropriate strategies by themselves (Kurt, 2020). The assumption could therefore be made that the students were not ready for the unforeseen, forced transition to online learning. Furthermore, it has been well documented that disruption of education negatively affects students; even without a pandemic, prolonged breaks can adversely affect performance in core subject areas (Bertling et al., 2020).

The adverse effects of the prolonged, hard lockdown created an awareness of the following shortcomings and challenges of our first-year ICT students:

- The students were fresh from grade 12 and barely started their higher education journey when the pandemic struck, new to higher education and the huge volumes of work.
- Because of the short time the students spent on campus before the lockdown happened, they were still inexperienced with the use of the LMS and online learning. The result of being inexperienced with using a LMS, they disregarded the importance of using the LMS to keep up. All announcements on the LMS are automatically sent to the students' and

lecturers' university e-mail addresses. New content was always announced, and students should have been aware of all the resources on the LMS.

- The students' lack of responsibility and maturity became apparent because:
    - Even though detailed, regular instructions and schedules were provided, few students followed the suggested schedules. For some, inexplicable, unimaginable reason, some students were not even aware of the published schedules and materials on the LMS.
    - It was therefore evident that students did not read their university e-mails regularly. All announcements on the LMS are automatically sent to the students' and lecturers' university e-mail addresses. New content was always announced, and students should have been aware of all the resources on the LMS.
    - Many students did nothing on their own while not on campus, waiting for lecturers to teach them face to face, the familiar way, which was impossible under the circumstances. When they started going back to campus, it was nearly impossible for those who took a prolonged break from their studies to catch up and succeed.

Referring to the assumptions about adult learners, the above clearly demonstrates that the students do not have a well-developed self-concept, they have inadequate experience to learn from, they are not ready or mature enough to learn from their environment and solve non-subject related problems, and they need external motivation to learn (Knowles et al., 2005).

A few of the students demonstrated traits associated with adult learners; they were internally motivated and mature enough to work independently. They followed the schedules, and used the provided resources, succeeded, and several of those even passed the subject with distinctions. The deduction is therefore that the materials and the presentation of the materials was adequate for self-directed, adult students with proper internet connectivity. However, to empower all the new, first-year students for successful online learning, guidelines should be developed and discussed (repeatedly) with the students.

Guidelines for Successful Online Learning

The students' lack of previous experience on working independently necessitates clear, easy to follow guidelines. Due to the rural living arrangements of most of our students, they often do not have a dedicated, comfortable space to study in their homes. They are also most likely expected to participate in domestic tasks. The guidelines should take this into consideration to be of value to the students.

During the pandemic, many websites and articles featured guidelines for successful online learning, and some proved to be very valuable (Global Online Academy [GOA], 2020; Joubert, 2020). Although the following guidelines are specifically developed for the University of Technology students, it might prove to be valuable to all students in one way or the other.

Table 1

Guidelines for Successful Online Learning

What?	**How?**

Organisation	• Organise your workspace.
	  ○ Find a way to isolate yourself when studying to ensure focus.
	  ○ Provide for proper light.
	  ○ A dedicated workspace will convey the message that you are dedicated and focused.
	• Develop a proper filing system per subject.
	  ○ You do not need expensive files, make use of boxes or bags.
	  ○ Make notes while studying and file the notes for future reference.

Physical Health and Wellness	• Make time for scheduled breaks, go outside, and stretch your legs. • Drink enough water. • Eat healthy food. • Exercise regularly, go for walks. • Sleep is important, develop good sleeping habits.
Prevent Distractions	• Share your schedule with friends and ask them to respect your study time. • If you are not using your mobile phone for your studies, switch it off when studying.

Planning	• Start with the published schedule:
	  ○ Plan per week and per day.
	  ○ Include time for your household tasks and socialising.
	  ○ Share your schedule with your family and friends.
	• Keep your eyes on deadlines.
	• Manage your time.

Do the work	• Work through the content according to the published schedule. • Do the activities/tasks/assessments. • Make notes and summaries.

What?	How?
	• Learn the theory.

Preparation	• Prepare for live online sessions:
	  ○ E-mail questions to your lecturers.
	  ○ Do the activities/tasks/assessments before the live online sessions.

Communication	• Contact your lecturers per e-mail. • Stay in touch with fellow students. ○ If possible, form study groups (study groups can be virtual or physical).

Connectivity	• Familiarise yourself with the LMS.
	  ○ Know where to access what.
	  ○ Access the LMS every day for announcements and new resources.
	  ○ Read your university e-mail every day.
	• If you do not have a 24/7 internet connection, plan your connectivity according to the schedule.
	• If you missed live, online sessions, watch the recordings.

Engagement and Participation	• Participate in subject-related discussions in groups.
	• During (live) online sessions:
	  ○ Take notes.
	  ○ Focus.
	  ○ Ask questions.

Reflection	• After (live) online sessions:
	  ○ Reflect on what you learned.
	  ○ Revise content you still do not understand, watch the recording.

Mitigation	• Reflect on potential problems that may arise:
	  ○ Prepare questions to ask your lecturer.
	  ○ Review problems that arose previously and reflect on how you solved it.
	  ○ Evaluate alternative solutions and actions.

The above guidelines will be presented to the students in an infographic to make it appealing and "student-friendly". At the beginning of a new academic year, it is advisable to organise a two-week long orientation for first-year students. Such an orientation should preferably be conducted on campus where students can be

guided on the use of the software they need for programming and other subjects. The orientation must also be utilised to make the students familiar with the LMS as the only delivery platform for online learning. The guidelines for successful online learning must be emphasised during sessions and must be made available on the LMS.

The level of maturity of the students might hamper the successful engagement during the two weeks orientation. Hopefully, the current pandemic and uncertainties surrounding it, might motivate students to actively engage during such orientation in expectation of online becoming the only mode of delivery at any time.

Conclusion

The personal experiences and challenges of the lecturer during a world-wide pandemic are shared in this paper. Students and staff were faced with new, unknown circumstances beyond their control. Students at the said university of technology were faced with the lack of proper resources, like inadequate or no devices, and poor internet connectivity in rural areas. First-year students were especially vulnerable because they did not have time to adapt to the demands of higher education and self-directed, adult learning before they were sent home.

Most lecturers were only familiar with the contact class model and did not necessarily use the LMS before to augment their teaching. Suddenly, lecturers were required to work from home and improvise to facilitate remote, multimodal learning, using the university's LMS. Some staff members also had challenges with poor connectivity in the areas their homes are.

Overnight, online teaching and learning became the new normal and institutions and staff had to adapt, develop, and deliver the best possible solutions to their students (Saboowala & Mishra, 2020). Educational institutions world-wide had to make sudden, drastic changes suitable to their unique student profile and environments. The truth is that nobody was fully prepared for the severe consequences of the pandemic to educational institutions.

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“I DON’T LIKE SEEING MYSELF” AND OTHER STORIES: REASONS FOR CAMERA (NON)USE DURING ONLINE LECTURES

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Abstract

The shift to online teaching necessitated by the 2020-2021 pandemic created changes that were not always beneficial to the learning experience. Lecturers often touted the fact that students left their cameras off as being one of the most negative aspects of lecturing online. A brief, open-ended survey completed by close to one hundred participants determined that the majority of online learners opted to switch off their cameras during synchronous online lectures. Participants supplied reasons for their choice in this regard.

Introduction

The Covid-19 worldwide pandemic of 2020 and 2021 and its resultant closures of educational institutions brought about unprecedented change in delivery methods. With the sudden, often unplanned, shifting to online lecturing, which frequently took the form of synchronous teaching, simply shifting the classroom to an online platform setting brought with it unprecedented repercussions. The physical detachment caught many unprepared for the change, not least the students themselves, who found their face-to-face, predominantly in-class lectures shifted to the clinical setting of the computer screen.

The shift was not an easy one. It is one thing having been trained in online delivery, planning courses that played to the strengths of the media available to the online class, and understanding the pluses and minuses of the format – it is an altogether different thing when lecturers who had only ever been in the classroom tried simply to change venue from the physical to the virtual, while trying to retain the same content and methods. In many cases, the results where less than satisfactory, with the level of satisfaction undulating both for those who taught and those who learnt. Some commentators seem to think that the move was apt. That, for example, “Zoom rooms were observed to be an efficient use of synchronous delivery with an hour and a half sufficient engagement time for the learners at any one given time” (Ensmann, et al., 2020, p.20). True, Zoom and its ilk were the best way forward in

the circumstances, and content was duly delivered, but the full university experience could not be had through courses that were totally delivered by this means. “Research across disciplines and in numerous universities worldwide revealed that the benefits of online lectures outweigh the disadvantages.” (Kinash et al., 2015, p.136). Research in Norway found that 65% of students were highly or very highly motivated for digital live lectures (Sørum et al., 2021). And that might very well all be true, but my own, non-empirically researched, cognisance of, at least, lecturer reaction in this particular instance of online lecturing imposition was that it would do, but little more than that. It was potentially the pandemic enforcement of the method in the lack of other possibilities that irked the most, but my impression of lecturer reaction was that it was a relatively negative one.

A straw poll of lecturer colleagues, trying to determine arbitrarily what was the main source of irritation during synchronous online lectures on platforms such as Zoom, Google Meet, and Microsoft Teams, almost unanimously highlighted the fact that more often than not students kept their cameras switched off. A lot of reasons were touted, most speculative rather than actual, which is why the limited research presented in this brief paper is intended to source reasons for the use or non-use of the online camera from students themselves.

“As lecturers, we expressed web-conferencing anxieties: a common pandemic trepidation. Our experiences of web-conferencing implicated heightened performance as we attempted to facilitate dialogue, removing PowerPoints within a blank, unresponsive void” (Westbrook et al., 2020, p.7). That blank, unresponsive void added to the anxiety and, being unable to get at least visual feedback to delivery, lessened motivation in both teacher and learner.

This led to a spate of research, trying to understand why the phenomenon was so wide-spread. For example, Gherhes et al. (2021), “In our study, the anxiety/fear of being exposed/shame/shyness was considered, for students themselves and their colleagues, to be the main reason that they do not have their webcam turned on during educational activities in the online environment” (p.1).

Gheres, et al. (2021) also give other reasons for the darkness of the student screens. “To this reason (...) was added the desire to ensure the privacy of the home/personal space, the fact that other people may appear in the background, or because students perform other activities in parallel with online classes” (p.9).

And yet, the opposite was also touted. That is, that putting the camera on could actually be a form of the student taking control. This opinion piece that appeared in *University Wire* in March 2020 suggested this.

> "There is a way that students can take back control of their productivity and harness motivation to learn once more, and that comes with changing one Zoom function: keep your cameras on. I know this may not initially sound ideal, but I truly believe it could be helpful. Just think about it. Seeing the faces of your classmates more effectively imitates the typical in-person learning experience, which may shift your mindset into focus" (Reese, para. 10-11).

But this seems to be so much wishful thinking. The reality was that "Zoom, 'felt unnatural' because only one person could talk and teachers dominated: 'No one talks on online classes except the teacher', classmates turned off videos and microphones and didn't participate: 'people tended to not speak (be muted) or show their face therefore it was hard to communicate or interact with them', and some students simply did not attend." (Yates et al., 2021, p.66). Attention, which "plays an important role in the maintenance of effective online learning experiences" (Kokoç et al., 2020, p. 3019) suffered in the process, definitely not least because the blackout permitted the lack of same.

Some have actually suggested that students keep their cameras off specifically because having them on can increase anxiety and stress, create 'zoom fatigue', have to contend with competing obligations, and because students have a right to privacy (Moses, 2020). On the other hand, some researchers are offering solutions ... or at least a potential regime of recommendations that they feel could aid students to be more inclined to put on cameras. Castelli and Savrary (2021), for example, suggest that offering alternatives to requiring video cameras to be turned on, explaining why camera use is explicitly encouraged, addressing potential distractions and giving breaks to help maintain attention, using active learning techniques to promote engagement, and surveying students to understand their challenges, could do this. That, of course, is one positive way forward. But we are still too close to the changes that caught many of us by surprise to understand the implications fully. This minor study, dependent primarily on random qualitative responses, is aimed at adding to the literature on the matter.

Methodology and participant distribution

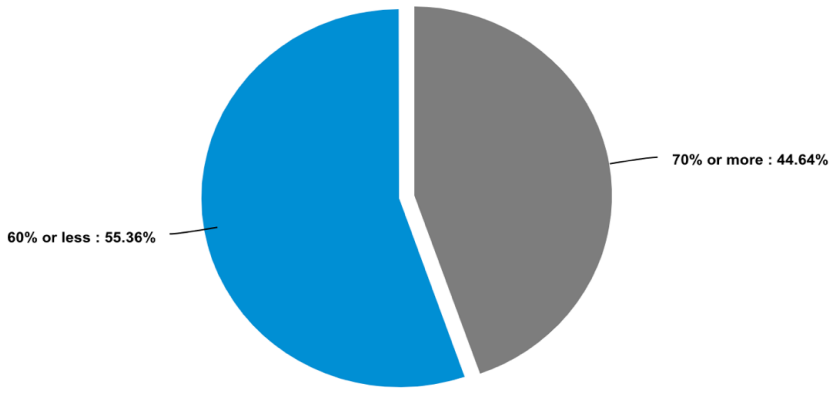
An online questionnaire using the platform Question-Pro was distributed using Facebook. Close to a hundred respondents filled in the questionnaire, which was made up of four brief sections. The first section was a multiple choice list of ten

percentages, from 100% to 10% or less, requesting participants to state the percentage of the time during online lectures that they kept their camera on.

Anybody who answered 70% or more was directed to an open ended question requesting reasons for this choice. All those who answered 60% or less were directed to another open-ended question also requesting reasons. Respondents were asked to answer either of the questions in as much detail as possible.

In fact, 44.64% of participants said they kept their cameras on most of the time, while 55.36% said they didn't (Figure 1).

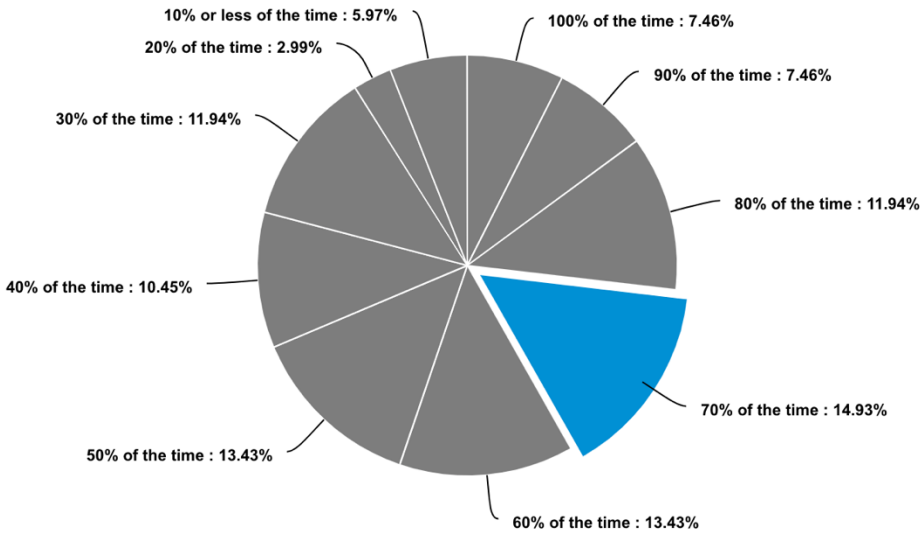
Figure 1
Camera Usage at 70% or More or 60% or Less



This can be further broken down by the ten possible percentage sections offered to participants. The range was from 5.97% with 10% of the time or less with their camera on to 7.46% of participants who had their camera on all of the time (fig. 2).

Figure 2

Breakdown of the Percentage of Time with the Camera on



Findings – Cameras on

The following is a selection of responses by participants who, in the main, decided to keep their cameras on.

A few opted for cameras on in order to help simulate the physical classroom, indicating a yearning for the return to normalcy of physical interaction. “It made the experience of attending a lecture very close to what used to be normal on campus” said one, and “Because I wanted to at least feel like I’m in a classroom” was another reaction with this motivation.

Some participants chose respect for the lecturer as motivation. “Because the lecturer asked us. And especially if I like the lecturer” and “Because I felt it was unfair on the lecturers and by having them on, it felt like there was a bit more interaction”, as well as “I feel like giving a sense of respect back to my lecturers. I know how hard it can be for some not to be in a lecture room. The least we can do is put on our cameras and participate.” Though some feared punishment more than the need for respect: “We were instructed to do so by our lecturers and if not, we would have been marked absent.”

But not everybody thought of it this way. For example this participant’s aims are clearly courteous: “Lecturers obviously have to keep their cameras on whilst

teaching and online education is already hard enough, so it is only fair for students to show their presence by keeping their camera on." The same can be said for the participant who wrote that since Zoom was meant to allow people to talk face-to-face and because of Covid this was the go-to platform for such human interactions, "leaving the camera off is equivalent to giving your back to someone who is trying to talk to you".

Of course, the online class is also made up of other students and not just the lecturer. One participant felt that cameras helped create a sense of community: "To maintain social contact with the rest of the class since we weren't meeting physically. To encourage others to do so too. It was also the university's regulations, but mostly because I thought it was a matter of courtesy." This can also be seen in this participant's statement: "I enjoyed seeing others as it made it feel more like being in an actual class, so I felt that it was a reciprocal thing and that I should also keep my camera on." The feeling of being part of a community, even if not a physical one, helped shift the clinical back to friendly interaction. "Leaving my camera on added a more human element to an otherwise completely digital method of teaching." The sense of being in a class if the camera is on is often mentioned, for example it was stated by this participant: "I believe there is more interaction between the lecturer and the student, and it is online etiquette. I did not feel different than if I were in a class."

Part of Gherhes et al., (2021)'s misgivings are allayed by one participant who wrote that: "My background mostly is quite neutral and during lecture hours my parents are at work so I didn't have any problem turning it on." And, in fact, the reason given by many as to why they keep their cameras off, prompts the opposite reaction from one pro-active participant: "This year I made sure to turn on my camera every time, which would force me to pay attention more and not play on my phone, and also to put in some effort in the morning." Without that effort, the same participant said that "It was more difficult to focus and I was easily getting distracted, I lost all sense of routine and never bothered to get out of my pajamas."

A new reality, indeed.

Findings – Cameras off

Those who opted to, in the main, leave their cameras off, were much more vociferous as to reasons why they decided to do so. The pajamas mentioned by the previous participant who actually switched on the camera to get out of them, were quite often mentioned as a reason why the cameras remained dark. Some examples:

“When it was switched off it was because I was in pajamas. Or because I went to the bathroom. Or a family member came into the room.” “Early mornings at home, I would not be dressed appropriately” and “Sometimes, I really didn’t feel like being presentable and I stayed in my bed”.

By far the majority mentioned self-projecting issues, distinguishing between the closeness of the image a camera projects and just being an almost anonymous part of a crowd in a physical classroom: “I find it difficult knowing that people might be watching me when I’m not aware. In a classroom I sit among others, so the face-to-face change makes me nervous.” Apparently, this reaches levels of paranoia at times. “I feel less paranoid that people will be looking at me while learning” and “I did not feel comfortable being recorded and monitored within my own bedroom/study”, as well as: “There's the fact that anyone can take pictures of you and share them with their friends. I didn't want the 'pressure' of having my camera on”. But then, there are also very simple reasons for this, as in the case of the participant who simply said that the camera was kept off “because I’m shy.”

But there have been some serious repercussions of the switch to online, with one participant admitting that “I had a very traumatic experience during the first semester, in which we reverted to remote learning, and it really made me feel insecure and uncomfortable to have my camera switched on. It was so traumatic that at that time I even slacked on my diet, could not sleep at night and found it hard to concentrate during the day due to anxiety.” There can be no doubt that the effect on some learners of their new reality was devastating.

The sense of “being in the limelight” was another reason why cameras were left off. “It felt awkward. Also, most of the students hadn't done the same and it felt uncomfortable being the only one or a few stared at. Anxiety I assume.” One participant analysed this and put it more eloquently: “A discouraging element is herd mentality. No one likes to be the only student (or one amongst very few) with their camera on. Not only does it make you feel like the limelight is now shared between you and a lecturer, but it can tend to make you a target, if the lecturer only sees you, they will inherently tend to look towards you for interaction.” Also succinctly put by the participant who said: “I don't speak much in class and get nervous when called upon randomly, lecturers tend not to do this if you have your camera off.” The reality of the classroom in which a student can disappear, displaced to the online environment where, if visible, it is much more difficult to not be in the public eye.

By far the majority of respondents' replies focused on insecurities with regards to personal appearance. "I often felt very self-consciousness when I saw myself on camera" and "With having the camera directly onto our faces, anyone would have the possibility to just look at you directly, creating anxiety". The intense self-criticism that comes with having to look at oneself for a long period of time should not be underestimated. "I feel uncomfortable as I see how I look on camera, and if I feel like when I am focused I look zoned out or odd on camera, I am instantly distracted". This was reiterated by the participant who wrote: "It is very tiring trying to look alert for two hours straight, in a classroom it doesn't feel as bad as there isn't a constant reminder in the form of your reflection right in front of you".

Not leaving home to go to a University campus has often made students just let themselves go. This can be amply seen in this comment: "In real life it's quite different to me personally – because you'd actually have some sort of motivation as to why you should actually get ready and look 'good'". And that "in real life" should be noted. The implication is very clear. Online lectures are not "real life". They are something else. Real life is when physical human interaction takes place. The home environment, that now had to substitute for the public environment of the classroom, was also often given as a reason for the blackout. A few examples: "I mostly kept the camera off when there were things going on in my room during lectures" and "Staying in a public area like the kitchen, the camera being shut off left my family free to act as they wished, instead of hassling about accidentally disturbing a lecture", and even because of lectures 'on the go': "On days where I finished work late and I was walking to the bus or actually using the bus, I could participate in the lecture without disturbing my classmates with the constant moving and bouncing that the bus resulted in".

Logically, having the camera off gave students the possibility of multi-tasking, something they definitely could not do in a physical classroom. Participants were quite up front about this. "Various reasons, mostly doing something else during sessions" and "It was a lot more comfortable. I could be in my PJs, have a dog in my lap, crochet (because it helps me not fidget and not play with my phone), have a coffee, etc." and "It was during a busy time personally, in which I needed to carry out certain responsibilities at home for my family at the same time" and finally "Sometimes I kept my camera off because I was eating or cooking".

A very few mentioned technical difficulties. "I mostly kept the camera off when the internet connection would be relatively weak compared to other days."
But there can be no doubt that the main reason for camera blackout was "I hated having to stay looking fresh or stationary".

Conclusion

A number of conclusions can be drawn from the statements made by participants in this small study. For example, there can be no doubt that the use of the camera during synchronous online lectures has enhanced self-consciousness in students. In the meantime, something positive for them, but negative for their concentration during lectures, is the fact that switching off the camera has increased their possibility to multi-task. This means that some will only listen to lectures, as opposed to directly participating in them with full focus. This can result in serious underachieving. Looking into this particular phenomenon might yield some interesting insights into the brand new learning methods that have been instigated because of the forced move to online lecturing.

The participants have made it clear that lecturers enforcing camera use are not popular, and though potentially more successful in getting students to switch on than others who are not emphatic, they still have a percentage of failure in their efforts. Something that goes well beyond the use of cameras, but which then impacts it directly, is the pandemic-induced lethargy that is at the core of "not looking good enough". This invariably leads to the self-conscious switching off, with all the resultant repercussions.

Some traits have been transposed from the physical classroom. Students who would normally be afraid to draw attention to themselves can now become extensively more invisible. However this might have led to even more reticence to participate, because of the close-up nature of camera framing making reticent students more evident.

Many are conscious that they are hurting delivery through their blackout, but this still does not stop them from doing so.

These two years have been a rollercoaster when it comes to research in instruction. There are swathes of areas that still need to be researched. For example, the use of social media chat functions, utilised by students for communal discussion, leading to what I perceive to have been a stronger than usual student activism. The use of social media as a whole within formal and informal instruction during the pandemic lockdowns also needs to be looked into. When I wrote in 2014 that "the incredible change that has come over the very nature of interpersonal interaction caused by the worldwide, whirlwind diffusion of social networks, is slowly being mapped by researchers, but it is very much a case of reality racing well ahead of our ability to understand it" (Mallia, 2014, p.xxiii), I suppose I was anticipating just how

important they would become as unique media of communications in the absence of a physical presence. Understanding their impact on learning during the shift to online instruction should prove to be fruitful for their planned use in any future format of instruction.

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STEAM WITH A GENDER PERSPECTIVE

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Introduction

Introducing the gender perspective in the different projects presented in this paper has its own reason for being. Year after year, the Spanish Ministry of Education and Vocational Training, in its yearly publication Equality in Figures, highlights the still existing inequality between boys and girls in the choice of science careers. In addition, the report gives the percentages in relation to other European countries and worldwide. In these percentages, the same concept persists: women and science do not seem to go hand in hand at the level they should (Ministerio de Educación y Formación Profesional, 2021).

In addition to the above data, the gender bias in the choice of STEM careers (Science, Technology, Engineering, Mathematics) in favour of men has been evident for several years now. Stoet & Geary (2018) insist on the persistence of this bias and the failure of the usual hypotheses to explain and mitigate it, forcing the search for new approaches. In this regard, the authors compare international data through reports such as the PISA 2015 Report (Organisation for Economic Cooperation and Development [OECD], 2016). The results show that in two out of three countries, girls are equal to or better than boys in science and are also well prepared to choose STEM studies, both at secondary and university level. However, the higher the equality bar in the country, the less women choose STEM careers, and consequently the gender bias increases. This is what the authors call the "*educational paradox of gender equality*", which means that the greater the equality, the greater the gap in STEM between women and men (Angulo, 2019).

Another study, which confirms the same data, refers to enrolment and degree completion data from Harvard and MIT Massive Open Courses, with students enrolled from 25 countries, where female enrolments are lower than male enrolments, but final completion is similar. Again, there is less gender bias and greater likelihood to enrol in less developed and less gender-equal countries (Jiang et al., 2018). Specifically, in Spain, of the enrolments made, 72% are men and 28% are women. Of these, 9.36% of enrolled men and 21.5% of enrolled women complete the course (Angulo, 2019).

These data are important in terms of the future of society we should be aiming for. Regardless of the gender bias, it has been observed that in recent years the number of young people studying science in Europe has declined (Robles et al., 2015). According to these authors, there is a difficulty in achieving a knowledge economy and scientific literacy among citizens. In this same perspective, Rocard et al. (2007) warn that the decline in interest in science lies in how it is being taught in schools. Thus, some authors such as Solbes (2011), Solbes Matarredona et al. (2007), and Lozano Lucia, (2012) have investigated the factors that are influencing dropout, as well as what innovative proposals could be addressed to tackle these attitudes. Results show that it is important to focus on compulsory education, where students have to pursue science studies without being able to drop out, but that this can be a key moment to motivate them or improve their attitude, and therefore their teaching should be improved to motivate them to learn.

If we add to these data the previously mentioned one about the gender gap in terms of science studies and skills, we must insist on including a perspective that reduces this gap. It is more than evident, and this is demonstrated by numerous studies (Bian et al., 2017; López-Navajas, 2014), that our society separates science from women, we can say that there is a gender stereotype where it is universally believed that women are less prepared for science and, especially some branches of science. In this sense, some data extracted from the Spanish Annual Report on equality figures of the Ministry of Education and Vocational Training 2021 quoted in Macho (2021) are to be expected, where we find that women choose more studies related to Education (77.9%) and Health and Social Services (71.8%). However, there is less presence in Engineering, Industry and Construction (29%) and Computer Science (13.4%).

In addition, the report also extracts other interesting data in relation to international data, such as, for example, a liking for mathematics, where 31% of female students in Spain say that they like it very much, compared to 42.7% of male students. In the European Union (EU) as a whole, 32.8% of girls and 44.1% of boys like math very much. In the OECD average, it is 32.9% and 41.5% (Macho, 2021). These data seem to us to be significant, since they indicate women are pushed away from careers linked to engineering, computer science and mathematics, while they continue to be leaders in sciences related to care and social services. The immediate consequence of these data is that the gender gap in the workplace will also increase, since the present and the future is and will be technological. It is therefore essential to tackle actions and projects that motivate and improve the figures for interest in science, both at a general level and for women and girls.

As a result of these studies and based on this perspective, we present below different Erasmus+ projects whose main objective is to bring science closer to the different school stages, and especially to female pupils.

Erasmus+ Projects about Gender and Steam

1. Science4Fun

The Science4Fun Project approaches science education as something fun and motivating, with the aim of generating educational resources to achieve this goal. As a European project, it involves partner organizations from different countries such as the Netherlands, Spain, Belgium, Portugal and Poland, whose experience is extensive in educational projects that promote the use of technology and teacher training, with the aim of providing them with more tools and resources in their classrooms. There is a need to develop projects and initiatives in the classroom that reduce the gender gap and encourage greater interest in scientific activities.

It is a 36-month project, which started in September 2018, co-funded by the Erasmus+ programme from the Netherlands agency. The project partners are:

- Stichting Kenniscentrum Pro Work (the Netherlands)
- Universidad Autónoma de Madrid (Spain)
- University of Humanities and Economics in Lodz (Poland)
- Fundación Siglo22 (Spain)
- JKVG vzw (Belgium)
- Sociedade Portuguesa de Inovacao (Portugal)
- Natsionalen ucheben tsentar (Bulgaria)
- Ljudska univerza Velenje (Eslovenia)
- Euroface Consulting s.r.o (Czech Republic)

The main objective of this project is to provide resources and tools so that science teachers can carry out their teaching work in a more attractive and motivating way. Specifically, the main objectives are to:

1. Make science fun for students.
2. Promote sciences among girls in order to improve the ratio of girls to boys in those studies.
3. Provide tools so that science teachers can achieve the above objectives.

All of this is materialized through a methodology that consists of five components, which will be described below.

1. Baseline tests

As part of the project, baseline tests have been designed to determine the state of knowledge of the pupils in the different schools participating in the project. This is not a curricular evaluation test, but a tool for observing, throughout the project, the evolution of the pupils in the subjects in question. The purpose of this action, therefore, is to know the evolution of the students' learning, by carrying out the baseline tests with them with a periodicity of approximately 6 months.

These tests are based on the main objectives of the European Qualification Framework (EQF) for lifelong learning (European Union, 2018). These are: to facilitate access to learning for learners and to enable mobility of learners between different countries of the European Union (The European Qualifications Framework (EQF) | Europass, n.d.). The EQF consists of eight levels in three domains: knowledge, skills and competences. Below is an extract from the framework for the EQF1 and EQF2 levels. (European Union, 2018)

Table 1

European Qualifications Framework: Excerpted Example

	KNOWLEDGE	SKILLS	COMPETENCES
	In the EQF, the knowledge is described as theoretical and/or factual.	In the EQF, skills are described as cognitive (use of logical, intuitive and creative thinking) and practical (based on manual dexterity and the use of methods, materials, tools and instruments).	In the EQF, competence is described in terms of responsibility and autonomy.
Level 1	Basic general knowledge.	Basic skills needed to perform simple tasks.	Work or study under direct supervision in a structured context.

	KNOWLEDGE	SKILLS	COMPETENCES
Level 2	Basic factual knowledge in a specific field of work or study.	Basic cognitive and practical skills needed to use useful information to perform tasks and solve common problems with the help of simple rules and tools.	Work or study under supervision with a certain degree of autonomy.

Note: Extracted from the European Qualifications Framework for lifelong learning. (EQF) - https://europa.eu/europass/en/description-eight-eqf-levels

2. Educative Science Resources

Once the teachers obtain the results of the baseline test, they will have science educational resources to work with the students. The interest of this action is to achieve one of the objectives of the project, i.e. to make science fun and motivating.

3. Comparison among the Participant Countries

By carrying out the baseline tests in the different partner countries, it is possible to find out the situation of pupils in the different schools, both within and between countries. This is done in an aggregated and anonymous way.

4. Narrowing the Gender Gap in the Study of Science

One of the project's actions is to generate and encourage interest in science careers among girls, as data shows that there is a gender gap in this respect. In this sense, the project seeks to give visibility to women scientists throughout history and around the world. To create references so that girls can dream and choose to be scientists, just like their male peers. And for boys to learn to value the scientific knowledge of their female peers in the same way as their male counterparts.

5. Online Training

With the aim of training teachers in the use of different methodologies, resources and tools, an online training platform has been designed. The courses provided deal with topics such as how to change the learning paradigm, new assessment models, making women in science more visible, internet tools for teaching science and methodologies such as Problem Based Learning (PBL).

2. STEAMitUP

The "STEAMitUP" project aims to develop an interdisciplinary STEAM programme to train students, school leaders, school staff and school communities in the application of STEAM activities, robotics and digital tools to help develop students' 21st century skills (creativity, problem solving, self-esteem and collaboration). The project aims to develop an innovative e-learning space for school leaders and staff using blended methodologies (face-to-face, online and mobile), tools and activities.

The following partner countries are involved in this project: United Kingdom, Cyprus, Ireland, Greece, the Netherlands and Spain, in particular the following organizations:

- Lancaster and Morecambe College (United Kingdom)
- Centre for advancement of research and development in educational technology LTD-CARDET (Cyprus)
- Future in Perspective Limited (Ireland)
- Palladion Lykeion Ekfpaideuthria Douka (Greece)
- Rijksuniversiteit Groningen (the Netherlands)
- Fundación Siglo22 (Spain)

The main objectives of the STEAMitUP project are:

- Build the capacity of teachers, school leaders and school staff to organize and implement STEAM activities in schools using digital (such as robotics) and non-digital tools.
- Develop the digital skills, the creativity, problem solving skills, self-esteem and collaboration among the students.
- Encourage and motivate students to engage in STEAM fields while reducing the gender gap.

This is materialized through interactive and collaborative hands-on activities that allow personalization of the learning experience, as facilitated by digital technologies. As we know, these technologies offer new ways of organizing and structuring teaching and learning and new accessible learning environments that can motivate and engage learners. However, successfully harnessing their full potential for education is first and foremost a question of improving education.

The aim of STEAMitUP is therefore to develop the capacity of teachers, through technology, to implement innovative practical activities that develop skills and

competences in students. The project builds on other actions in which consortium members have been involved in the past, such as School on the Cloud, Making Learning, Science Fun, and Science Fiction in Education.

STEAMitUP focuses on leveraging STEAM subjects and robotics to develop students' critical skills through digital and non-digital tools.
The project also includes the development of a wide range of tools that will combine rich material for use by teachers and the training of teachers to use these innovative tools and to be able to use, adapt and localize the STEAMitUP toolkit.
To meet the above needs, multiple innovative aspects can be identified in the STEAMitUP project in terms of design, development and implementation:

- **Online platform**. The STEAMitUP project is based on an online platform that allows partner organizations to customize tools, activities and resources needed for each school. The platform serves as a "one-stop-shop" for teaching and learning to use innovative learning tools to teach STEAM and develop basic skills in students (problem solving, creativity, self-esteem), loaded with best practices, lesson plans, workshops and video guidelines. Each school can customize its programme and download it.
- **STEAMitUP Toolbox**. It includes a set of learning resources and pedagogic material built around challenges.
- **Didactic activities**. The project activities make use of robotics and other practical and innovative 21st century digital tools.
- **Learning**. The project follows a systematic approach involving all target groups. Therefore, a group of educators will be generated and trained on how to use robotics and other tools to actively encourage and engage learners to develop basic skills and competences and to thrive in the digital world. In this sense, blended learning modules (face-to-face and online for teachers) are developed to build their capacity on how they can use robotics and other digital artefacts in their classroom for STEAM education.
- **Didactic material**. It includes lesson plans, workshops, thematic school days, materials for the development of students' skills through interactive activities for students. This section also gives special relevance to the visibility of women and girls in science, providing materials, specific celebrations, etc. The material will be available for different age groups, from primary to secondary level. Teachers and schools will be able to adapt the project material to their national context and to the specific needs of their students.

3. STEAMY-WONDERS

STEAMY-WONDERS has as its main objective the promotion of women's participation in science careers. As mentioned in the introduction to this paper, STEAM (**Science, Technology, Engineering, Arts and Mathematics**) is still a male-dominated field. This project, through a compendium of Interactive Infographics, aims to motivate girls in STEAM careers, in addition to developing their capacity in each of the areas that are integrated and making visible some of the world's benchmarks in the world of science. In addition, the project also consists of a teacher training programme in the use and creation of infographics and a MOOC that collects all the results generated during the project.

The partner countries of this project are Croatia, Ireland, Germany, Cyprus, Czech Republic, and Spain, namely the following organizations:

- CALLIDUS (Croatia)
- Spectrum Research Centre (Ireland)
- Skills Elevation FHB (Germany)
- SYNTHESIS (Cyprus)
- BFI (Austria)
- JAITEK TECNOLOGÍA Y FORMACIÓN SL (Spain)
- ALIANCE LEKTORU a KONZULTANTU (Czech Republic)

The objectives of the STEAMY WONDER project are to:

- Promote a culture of scientific thinking among women, using evidence-based reasoning in decision-making, especially with regard to career planning.
- Provide appropriate and tangible case studies to ensure that women have the confidence to participate in an increasingly complex scientific and technological world.
- Develop a set of tailor-made resources for women that address problem-solving skills, innovation, analytical thinking, critical thinking, spatial awareness.
- Provide guidelines for human resource managers to enable gender-neutral recruitment, retention and promotion in the STEAM sector.

To this end, the following lines of action are proposed:

- Challenge-based resource generation for women in STEAM disciplines.
- Training for vocational training teachers.
- Toolkit for Human Resource Managers

- Steamy Wonders MOOC and Community of Practice

Among other products generated by the project, a compendium of Interactive Infographics presented in the form of posters with QR codes is proposed. Each of the infographics is composed of 4 elements, presented in the form of QR codes, which work on one of the areas that make up STEAM (Science, Technology, Engineering, Arts and Mathematics). The QR codes are linked to digital learning materials that encourage users to interact with the information and learning content.

In addition, there is a strong emphasis on training Vocational Education and Training (VET) teachers in the use and creation of Interactive Infographics. To this end, STEAMY-WONDERS proposes a training programme for VET teachers to support them in the use of Infographics in their teaching practice in order to promote female participation in science careers. In addition, the programme also encourages training in the creation of materials so that teachers can create their own resources and can continue to extend this type of teaching.

In addition, the project develops a **MOOC** in which vocational tutors, support staff in companies, industrial relations professionals and young employees can access all learning materials developed in the STEAMY-WONDERS project.

4. iMAS

iMAS is a project whose main objective is to help teachers to know the evolution of their students' learning in the areas of mathematics, as well as to offer online resources to use with their students. In addition, teachers will have access to training courses, together with advice during the activities carried out in the project.
The partner countries that make up the iMAS consortium are Spain, the Netherlands, Belgium, Cyprus, and Ireland. Specifically, the participating organizations are the following:

- Universidad de Málaga (Spain)
- PRO WORK (Netherland)
- ARTEVELDEHOGESCHOOL (Belgium)
- CARDET (Cyprus)
- FIPL (Ireland)
- JAITEK Tecnología y Formación SL (Spain)

The objectives of the iMAS project are:

- To provide teachers with a statistical data tool to automate measures of mathematical learning progress, reducing the time spent on administration and transferring it to teaching informed by empirical test data.
- To increase levels of digital literacy in schools so that people become more self-reliant in the use of technology and less dependent on formal retraining whenever there is a change in the technology ecosystem.
- To develop a strategy to support the development of open educational resources, including free services based on a sustainable business model that is self-sustaining.
- To gather empirical evidence of what children know and can do in mathematics to feedback and develop the curriculum based on direct evidence.
- To provide a teaching resource that showcases best practice in mathematics teaching, including schemes of work, lesson plans and other resources.

In order to achieve these objectives, IMAS is therefore composed of 4 fundamental pillars: Training, Repository, Baseline Tests, and Statistics generated.

1. Training

The online training consists of 5 courses which, on the one hand, will enable teachers to learn new methodological models adapted to the cooperative and integrated work of students and, on the other hand, to make mathematics education more visible among the female sector in order to encourage girls to **choose science careers**.

2. Repository

The project proposes a repository of online resources classified using a taxonomy developed by the project that allows **searches** to be **tailored to specific needs**. The repository contains a wide variety of resources and activities for use with students.

3. Baseline Tests (BLT)

This project proposes a series of tests divided by levels (EQF1-primary, EQF2-secondary, EQF3-baccalaureate), which cover 6 different areas of mathematics: Algebra, Geometry, Statistics and Probability, Arithmetic, Number Theory and Calculus and Analysis. These tests are not evaluations, as all the tests at each level have the same difficulty, but they allow us to know the evolution of the students' learning both at group and personal levels, being able to detect the areas where they are having more difficulties and therefore intensify these areas with the resources proposed by the system as well as those proposed by the teacher. The idea is to carry out tests approximately **every five months**.

4. Statistics

Teachers will obtain the exact results of their students' level, both at an individual level (by students) and at a group level (class). They will also be able to visualize the evolution of their students' learning as they periodically complete more tests. On the other hand, in an **aggregated and anonymous** way, researchers will be able to find statistics at both national and European levels.

Results and Conclusions

The following are the results obtained to date from the Science for Fun project, as it is the most advanced one, where pilots have already taken place, and so far 2,471 users have participated, of which 2,361 are students and 85 are teachers. Teachers get all the data about the evolution of their students in the Learning Platform (https://learning.science4fun.eu/) where all the Base Line Tests and are, together with the rest of services as recommendations of resources from the project repository, or several courses about tools, methodologies and women visualization in Science. Data are presented in detailed tables, where teachers can select the way to present the data using the variables (Sex, EQF, Grade, Student, Area and Topic).

A sample Group Report is presented in Figure 1.

Figure 1

Sample Data Details Table of Four Students

DATA DETAILS

Sex EQF

Grade

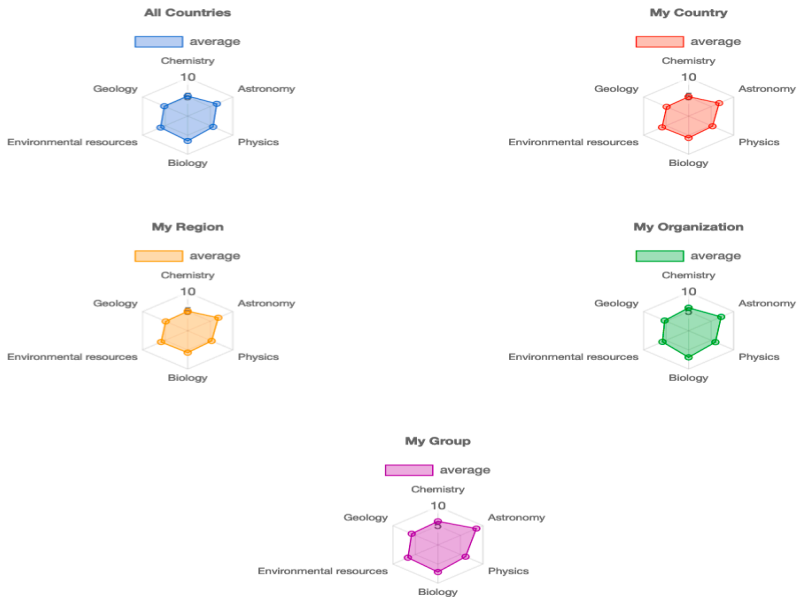
Student Area Topic

			Total
⊟ S4F User, Student 050027 (ES) (Student ID:645)	⊞ Astronomy		10.00
	⊟ Biology	Botanics	0.00
		Cellular structure	10.00
		Genetics	10.00
		Zoology	10.00
		Total	7.50
	⊞ Chemistry		7.50
	⊞ Environmental resources		2.50
	⊞ Geology		7.50
	⊞ Physics		2.50
	Total		6.25
⊞ S4F User, Student 050028 (ES) (Student ID:646)			7.71
⊞ S4F User, Student 050029 (ES) (Student ID:647)			6.25
⊞ S4F User, Student 050030 (ES) (Student ID:648)			6.25

And teachers are able to see the global situation of their groups and how that compares to the school, the region, the country and all the countries, as can be seen in Figure 2.

Figure 2

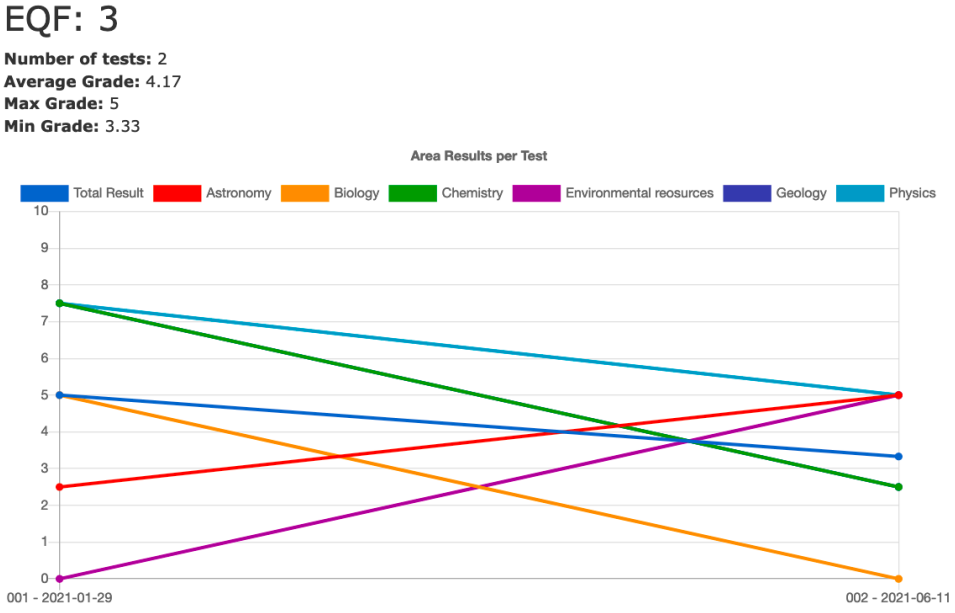
Radar Figures for My Group and Other Groups and Countries



And they can also check on the evolution of a concrete student, both graphically (Figure 3), but also in a table as seen before.

Figure 3

Evolution of learning for one student



In all the other projects, the pilots have not started and are planned for October 2021. In all of them courses for teachers have been developed together with different OERs to be used by students.

In the case of IMAS, results will be looking similar to Science for Fun ones, but in this case, dealing with Mathematics instead.

As a general conclusion, it is necessary to incorporate actions to support and improve STEAM learning, especially focusing on the gender gap. It is almost certain that the future will be technological so, if we want to generate a more equitable and fair world, we must incorporate the gender perspective in STEAM learning.

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COVID, ICT, U.S. CENSUS 2020, AND AUNT KITTY'S HOUSE: VANQUISHING THE CHAFF THAT CHAFES

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Abstract

This paper synthesizes three profound personal experiences experienced during the pandemic that were enhanced by ICT: providing a crash course in professional development to faculty; working on the U.S. Census 2020; and clearing the home of an aunt who had passed suddenly of COVID-19. Common threads are identified, including challenges and solutions.

Introduction

The pandemic has had a profound impact on all of our lives, as educators, as citizens, as family members. This paper is my attempt to pull together those three threads of my life in order to identify the commonalities and the lessons related to Information Communication Technologies (ICT). My husband asked me as I was writing "Is the theme of your paper how technology helped with overcoming coronavirus restrictions?" And after giving it some thought I said "No, it's the flip: it's how coronavirus compelled us to focus the use of Information Technology Communications in education and other areas of our lives so we could be as efficient, productive, and happy as possible." In other words, what did we get out of it, not just how did we respond to it. This is my personal narrative. A number of the conference presenters this year have talked about the fact that we all have stories and in a time of great social distancing, it is more important than ever to share our stories, to share our humanity. I will share three stories here, focusing on how ICT related to my work in education, my temporary position with the US Census 2020, and my role as Administrator for the estate of my aunt who passed away of COVID-19 a year ago, at 96 years of age.

In response to a Hiram College "Surprise Special Topic Writing Contest" in April 2020 "about some aspect of our current COVID-19/social distanced world", I wrote a poem a few days after my 96-year-old aunt was diagnosed with COVID-19 in a nursing home, and a few days before she passed away. It takes the very structured form of a villanelle, probably the most well-known example of which is the Dylan Thomas poem "Do Not Go Gentle into That Good Night".

Corona Connections

Embrace for all safe social distancing.
And grieve sweet souls succumbing every day.
Coronavirus: curse—and hidden blessing?

No need to fritter time on fancy dressing.
Below the waist Zoom cameras do not stray.
Embrace for all safe social distancing.

My spirit soars when fresh dough I am pressing
Like both yiayias, a century away.
Coronavirus: curse—and hidden blessing?

Homemade granola is a joyful messing.
The pantry challenge helps ward off decay.
Embrace for all safe social distancing.

Park walks with loved ones coax complete de-stressing
Four gentle deer delighted yesterday.
Coronavirus: curse—and hidden blessing?

Our homemade masks have led to some unmasking
of chaff that chafes – so let it blow away.
Embrace for all safe social distancing.
Coronavirus: curse—and hidden blessing.

In this paper, I will pull together three huge aspects of my life affected by the pandemic, in particular how each evidences the "chaff that chafes" and what we can do about it.

COVID-19 and ICT: The Pivot to Online and Remote Learning

A number of papers and workshops at ICICTE 2020 address the impact of COVID-19 on ICT and the pressured pivot to online and remote learning. Coetzee and Matthee (2021) discuss how the pivot to a "remote multimodal mode" for learning was a particular challenge for first-year students and cites research indicating instructors were overwhelmed. Professional development has been critical, and Hiram College is one typical example. I retired from my full-time position at Hiram College in February, but was included in conversations with the IT department in early March about the need to support all courses using ICT and to prepare faculty with a crash course in online and remote teaching. Faculty were given two days—and the students were kept away—for training, and classes resumed the next day online or remotely, or both. As use of the Learning Management System for teaching was

previously optional, a number of faculty found themselves using a tool with which they had little prior experience.

What were some of the specific challenges? Faculty had to:

1. Master new techniques specifically related to the LMS and web-conferencing, including virtual office hours;
2. Decide how to share materials they might have distributed face-to-face or just demonstrated while in the classroom, at the same time respecting copyright;
3. Rethink assessments by moving them online, possibly with online proctoring; and
4. Facilitate interaction, including the use of discussion forums, group projects, and realtime tools like web-conferencing or breakout rooms on Zoom. Mallia (2021) presents a much-needed exploration of reasons why students do or do not choose to activate their cameras during realtime interaction.
5. Maintain sanity and balance while adjusting to changing mandates concerning course delivery.

The best strategy for success in teaching and learning was to remain focused on learning objectives. Halpern et al. (2021) report on the development of a model for the integration of technology into pedagogy, and learning objectives are a key component of Phase 2, before the selection of teaching strategies and digital resources. Quality Matters—an international, non-profit organization focused on online course design and professional development of individuals involved with online learning (Varonis, 2013)—recommends beginning with learning objectives and aligning other course elements to those learning objectives to enhance student learning. It is helpful to think of course design as a backwards design project: what is it you want learners to achieve, and then what's the best way to help them get there? Technology can offer us some of those strategies and solutions.

With the sudden move to online and remote learning in Spring 2020, institutions needed to first overview what they needed to do, and where they needed to go. One of the responses was professional development for the instructors and administrators that were going to be involved, sometimes in-house and sometimes external. Quality Matters reported in 2020 a 94% increase in higher ed professional development, and that was because of COVID. What happens when we don't leverage technology in response to an emergency? Maria D'Esposito (personal communication) related that in Brazil, nine out of 10 elementary schools did not return in Fall

2020. The situation was worse for the public schools that it was for the private schools, which means socioeconomic inequities become magnified. When digital issues cause differences between populations in a particular country, then that drives a wedge between different social classes, where the wealthier people will be able to continue and people with fewer resources will not. And that is a serious social problem.

In 2020 we waited and wondered. In the U.S., the Center for Disease Control shares daily updates of COVID cases and deaths, and the curves looked like a rollercoaster at a theme park. A peak was followed by a valley but then the next peak was higher. In fall 2020, the third peak became exponential, and the 4th peak went even higher as a result of the Delta mutation. In addition, for political reasons a segment of the population refuses to vaccinate, which increases the probability of mutations and another increase in cases.

How does "the chaff that chafes"—something you don't want, something you want to blow away—relate to ICT and online and remote learning? The chaff that chafes is any course-related activity that does not promote achievement of learning objectives, or is too difficult to accomplish in an online or remote format given time constraints. In her presentation at this conference on the FAnTASIA project, Pyrini et al. (2021) commented that the team realized the surveys were too long, so they had to trim them. Another challenge is classroom activities that normally rely on complicated face-to-face explanations, but this becomes more difficult in the remote environment. What is the solution? An informed revision strategy to convert face-to-face courses to online or remote. Change activities, revise them, delete them, but don't allow them to interfere with achievement of the learning objectives.

U.S. Census 2020

I turn now to a second aspect of my life affected by the pandemic and facilitated by IT: the US Census 2020. By law, the census is conducted every ten years to identify demographics of the population on April 1. Right after my formal retirement I read that the Census planned to hire thousands, and I thought it was a great opportunity to work on an initiative I've used in my own research. Population distribution is used to determine how many congressional representatives will be allotted to each state, as well as determine where the federal government can best share its resources. In addition, major companies use census data to determine where to build or expand. Therefore, an accurate count is extremely important. Traditionally, the census sends out a written survey for each household to complete, and in 2020 for the first time it was also possible to respond online. However, not every household responds to the invitation, which necessitates the need for the Nonresponse

Followup (NRFU) operation. After fingerprinting and a background check, I was hired as a Census Field Supervisor (CFS) for a local region. All the CFSs were originally intended to participate in intensive face-to-face training, but because of the pandemic that pivoted to a two-hour face-to-face training, with the remaining training and assessments online. This pivot was problematic since the materials had been developed so quickly and there was little time for testing and evaluation. All CFSs were assigned an iPad and an iPhone 8; this was the first-time digital devices were used for monitoring and conducting field operations. CFSs provided half-day training to the Enumerators (actual door knockers), who were assigned iPhone 8s with cellular data but no Internet connection. Their cellphones would generate a daily route and lead the Enumerators through the census process at each address, branching to prompt for a proxy if no one at the address was available. Enumerators also submitted time and mileage reports through the iPhone. They were instructed not to use their phone cameras for any reason but to take pictures of expenses.

One unforeseen challenge was that the phones auto-generated cases for each Enumerator from a database and suggested a route every day, instead of the previous practice of issuing a list of addresses on paper at the beginning of every week. Sometimes, the auto-generated route was circuitous: it could begin in one neighborhood, direct the Enumerator to another neighborhood 20 miles away, and then return them to the first neighborhood. The phones also tracked location, so the software could generate an excessive travel alert if an Enumerator followed faulty route directions; as a supervisor I had to investigate and resolve each such alert. My solution was to tell the Enumerators "Overview where you need to go. Don't just blindly follow those instructions. Create your own logical route."

I encouraged the Enumerators to troubleshoot intelligently when the software did not support their efforts, and I did the same. When the phones failed to prompt the Enumerators to find a proxy, but would generate an alert that they had failed to do so, I reported the software glitch to my director, resolved the alerts with the words "software glitch", and encouraged the enumerators to be creative as they navigated the software and searched for proxies. When some of the enumerators were sent out to very rural areas where cellular coverage was non-existent or very weak, I found and distributed paper maps to them, and encouraged them to call for realtime help—I could research addresses on my computer, take pictures of a neighborhood or home from my screen, and then send those pictures back to them. When Enumerators needed a record of helpful signs, i.e., contact information for an apartment manager or the layout of a new neighborhood for which the census did not have street addresses, I encouraged them to use their phone cameras as this was more efficient than taking extensive notes. I continuously encouraged them to "keep your end goal in mind. Use the technology to help you while you're

respecting privacy—don't photograph people or their houses." We used the technology to complete our goals, even if we went beyond the original training.

One story illustrates this strategy. There was a large home at the end of a very long driveway behind a locked gate. Multiple Enumerators had been sent to that home but could not get close enough to the house to leave a notice; they also reported the mailbox was always full (although they could not legally leave the notice there anyway). When an Enumerator called for advice, I suggested he continue on his route and then started my research. By looking up the address on a county map, I identified the owner, whom I then googled, discovering he had recently pled guilty in a high profile court case. Next, I logged into the County Clerk of Courts website, searched by name to find the case, identified the defense lawyer from a court docket, googled the lawyer, and left a message with the reason for my call. The lawyer called back, explaining that sentencing had been delayed due to COVID and that the individual was in that home on April 1st. The next morning I identified the next Enumerator scheduled to visit the home, called him, and suggested he use the lawyer as a proxy; unfortunately, I did not have the permissions to resolve such cases myself. None of these research methods were included in the training, but I totally enjoyed the problem-solving challenges and successes.

My last day on the census was at the end of October, a week or so after the count officially ended; our presidential election was the beginning of November. The normally bipartisan census was highly political in 2020, as then-President Trump did not want to include undocumented immigrants although this conflicted with the Constitution (Liptak & Wines, 2020). However, the Trump administration was supported by the Supreme Court in its attempt to stop counting early. Because of the pandemic, there had been a delayed start, so ending early would leave it likely that traditionally undercounted populations would be even more likely to remain uncounted and many questions whether the results would be valid. The deadline changed five times just during the four months I was involved.

What is "the chaff that chafes" in U.S. Census enumeration: guidelines or prohibitions that don't promote the achievement of census objectives, which was to determine how many people are living in a community on a specific date. Also, any technology that interferes rather than assists, which is why I encouraged the Enumerators on my team to keep the end goal in mind. What is it you need to do? How do you best accomplish that?

Aunt Kitty's House

A third area of my life affected by the pandemic and facilitated by IT was my administration of the estate of my Aunt Kitty, and in particular cleaning out and selling her home just west of Philadelphia. It was originally the house my grandmother (Yiayia) bought and moved into with her four children in 1944, the oldest being my mother, who was then 21. Figure 1 is a picture of Yiayia and her daughters from about that time.

Figure 1

Evangelia Tsimpinou Diamanda and daughters Florence (l), Kitty (r), & Jean (kneeling) circa 1944

Aunt Kitty was the last one living in the house as well as the last one living. Yiayia had immigrated in 1920 and married her fiance the next day, so the house had a hundred years of history in it. Both Yiayia and Aunt Kitty were highly organized—and saved everything. The first and second floors were meticulous, closets and drawers neatly full, while the basement was a basement. And in the basement there were original naturalization papers, fuel oil bills from the 1940s, Aunt Jeannie's wedding gown, and hundreds and hundreds of plastic containers. One of the pieces

of paper I found made me laugh: “Keep this notice of payment due”. It doesn't say when you don't have to keep the notice anymore, and the date due was 1973. With my husband's help, we developed a project management scenario for Aunt Kitty’s house. The goal was to prepare the house for sale while honoring the history, contents, and the stories, and to distribute items equitably and sensibly. What was the challenge? The time frame, the fact that there were four immediate nieces and nephews that lived in three states and there was no will, and our need for multiple out-of-state trips to accomplish the task. The solution was to overview the project and divide it into manageable phases so we could work as efficiently as possible. The first phase was simply to clear the first and second floor rooms for real estate pictures—sometimes that meant pushing things from one corner to another just for the purpose of taking the picture, and bringing home to Ohio piles of papers so we could look through them.

There were surprises. I found a note my grandmother wrote into a January 1948 calendar where she provided hints about where she had hidden items, unfortunately inside appliances no longer in the house. Aunt Kitty hid U.S. Treasury Bonds in envelopes inside boxes inside cupboards, even though no one could cash them without proper identification. There were also tears. We found letters that gave us insight into what the family had suffered, especially during the Depression. In other words, I couldn't simply take the advice of the real estate lawyer to bring a company in to clear the house and be done with it. I looked at every single piece of paper in that house, and it was really important to do so.

And how did technology help with the house? First with communication, all kinds of communication. I used my Apple pen on my iPad for multiple signatures and sent back “paperwork” within minutes many times during the process of this sale. Second, with internet searches—there was no internet at Aunt Kitty’s house so I used the cellular service on my cell phone to search for contractors and services for repairs, for example, for the sidewalk and front steps that the city inspector said had to be repaired. I made online payments. I used my iPhone for taking and sharing pictures, and we purchased a metal detector so that we could scan every possible hiding place, having found that note that Yiayia left in the 1948 calendar.

And what is the chaff that chafes in this scenario? Any attachments or frustrations or crumbling foundations that don't promote a smooth goodbye. or achievement of the project objectives, or just to pass the house into the hands of another family that will love it and honor it and respect it as we have. You have to repair those crumbling foundations, and they can exist in a course or census processes as well.

Vanquishing the Chaff That Chafes

Cleaning out a house or supervising a census team has parallels with revising courses for a change in delivery: you need the right tools and devices, and you have to be sure of where you are going, your final project goal. If the foundation is crumbling, repair it. If the toolbox you've been given doesn't contain all the tools you need, go after them yourself if you can, or talk to others who have the ability to do so.

Communication is everything. You need to make yourself available to the stakeholders: those could be the students, the census Enumerators, the cousins. Keep everybody in the loop. Flexibility is a virtue. COVID may change how we do things but not what we want to accomplish, and as the American philosopher Thoreau said, "Simplify, simplify" (1854, p. 99). Let go of activities, unproductive rules and regulations, or physical items that do not add value and just cause clutter, even though it can be difficult. Let go of the chaff that chafes.

And then, share your stories. This is a big thread that has run through the ICICTE 2021 conference and also these three big, profound experiences I've lived through in the last year. If you teach, make it clear why your course or your training is designed the way it's designed, the significance of each activity to your students, your passion for your field and how and why you entered it—share that with your students so that you take on flesh and they know more about you even if you're not physically in the same space. "Distanced" does not need to mean "distant". For the U.S. census, I think we need to make more clear to the people whose doors we're knocking on why it's important and how it impacts communities, and also that, by law, data is released only in the aggregate; individual data cannot be released for 72 years (meaning, in 2092). Perhaps then people would be more compliant and census workers will not have to follow-up with so many. And at home, identify what you value and why you value it. At Aunt Kitty's house, I was about to put a blanket in a donate pile when I realized it was subtly embroidered with my grandmother's maiden initials; I believe it was part of the dowry she brought with her from Asia Minor in 1920, and I wish I knew the story. But now I'm keeping it.

We need to value what is valuable. We need to vanquish what is not.

Acknowledgements

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VRTEACHERS: VIRTUAL REALITY-BASED TRAINING TO IMPROVE DIGITAL COMPETENCES OF TEACHERS

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Abstract

The coronavirus (COVID-19) pandemic has created an educational crisis, affecting nearly 1.6 billion learners in more than 190 countries. COVID-19 highlighted the urgent need for the digital transformation of Higher Education Institutions (HEIs), and the use of novel and modern technology-based methods in teaching and learning. The current paper presents the VRTEACHER project, which proposes modern digital education responses related to educators' training via novel Virtual Reality (VR) based pedagogical approaches for virtual practicum. The project responds to the need for the digital transformation of higher education and the development of high-performing digital education ecosystems, through the use of VR digital technologies as part of teachers' training methodology.

Introduction

Teachers are one of the most powerful and influential forces in education. Nowadays, they face unprecedented challenges with classrooms being more complex, multicultural, and digital than ever before. The COVID-19 pandemic created another humanitarian crisis with a significant impact on teaching and learning. For teachers, the pandemic is an adaptive and transformative challenge, one for which there are no guidelines to follow for appropriate responses, as described in a module published by the Organisation for Economic Co-operation and Development [OECD] (Reimers et al., 2020). Teachers were unprepared not only to manage such a crisis but also to deliver ICT-based education. The teaching profession is in need of updated training that can ensure teachers' adaptive responses and crisis management for potential future challenges, such as those caused by COVID-19. Additionally, teachers need novel and ICT-based tools to empower their skills and knowledge, ensuring successful classroom management in uncertain times such as COVID-19.

In this context, the VRTEACHER project aims to strengthen the profile of the teaching profession and empower the personal and professional development of teachers through the use of an innovative Virtual Reality (VR) based framework. The significance of using VR methodology for teacher training lies in the fact that

virtual environments offer a safe and controllable space for constant practical training, experimentation, mistakes affordance, and reflection, without risking hurting in any way a real student. Equally important is that the scenario within the virtual world can reflect real-life incidents and extreme situations that cannot be replicated in a real classroom setting.

The VRTEACHER Project

The VRTEACHER project addresses the need for modernization and digital transformation of teacher education and training and aims to empower educators/teachers' competences, skills, and readiness through a VR training method and tool. Through immersive scenarios that reflect real-life-based incidents associated with crisis such as COVID-19, the VR tool aims to enhance skills such as empathy, perspective-taking, self-efficacy, adaptability, etc. The VRTEACHER project is a two-year Erasmus+ project that will be implemented in five countries: Cyprus, Greece, Spain, Ireland, and Malta.

The main target audiences of the project are pre-service student teachers (higher education students, PhD candidates, etc.) that need to acquire key and life competences that will support their professional development as well as in-service educators/teachers/trainers that need constant lifelong support to enhance their professional development. The consortium will actively involve the target audience in all project activities and will deliver training workshops related to virtual reality and its use in education and teacher education. Additionally, all partner countries will implement and evaluate the VR training tool to define its impact on the personal and professional development of teachers.

The project results that are expected by the project's completion are:

- The VR-based competence framework for teacher training;
- A publicly dynamic VR training tool available in multiple languages and platforms (pc and android) (IO2);
- A report discussing the impact of the VR teacher training tool;
- A best practices guideline handbook that will summarize the methodology and implementation of innovative VR-based approaches in teacher education.

Equally important is that the VRTEACHER project addresses inclusion, diversity, and equality, aiming to enhance teachers' intercultural competences. The need to improve teachers' intercultural competences has been highlighted by the European Commission as a growing number of teachers experience culture shock and struggle to better serve students from cultures other than their own (Tenreiro et al.,

2020). Additionally, COVID-19, along with social distancing and isolation restrictions, has had a notable negative effect on supportive classroom ecosystems. The VRTEACHER project emphasizes the importance of inclusion, whether teaching is online, face-to-face, or using a combination of methods. Practical training within the proposed VR tool aims to prepare teachers for inclusive digital teaching, ensuring equal opportunities for all students. Raising teachers' awareness and sensitivity to students' problems will increase teachers' understanding, as VR is an empathic medium allowing perspective-taking, placing teachers in the position of students allowing them to experience the various incidents and problems through their eyes. Furthermore, the VRTEACHER project aims to lay the foundations for more inclusive societies through education, as education cultivates students concerning cultural diversity

Conclusions

Nowadays, classrooms, including digital classrooms,, have become more complex, diverse, and dynamic environments. The modernization of teacher education, high-quality teacher training, adaptability, and readiness towards using technology-based technologies and tools will allow teachers to stay at the top of their game. The VRTEACHER project aims to strengthen teacher education using novel Virtual Reality (VR) based approaches to train teachers and enhance their adaptability, readiness, and ability to respond and deal with crisis situations. The use of innovative VR technology can work as a driver of improvements in teacher education, maximizing teachers' expertise. In the long-term, enhancing the quality of the teaching profession will make the profession more attractive and will motivate teachers to desire and engage themselves in continuing professional development.

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FAnTASIA: Fairy Tale Science Augmented

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Project Description

FAnTASIA project aims at developing an educational package for the teaching of some basic scientific concepts & skills. It can be easily used by anyone regardless whether they are teachers, parents or guardians and regardless of their training. It can be used independently in class or at home, with the support of an adult. The educational material will be implemented in science classrooms as well as at homes and science centers, in participating EU countries and evaluated within specific educational objectives. Content will be delivered through the book and mobile application powered by Augmented Reality (AR) that helps to understand three science concepts for kids in K-12 grade.

The basic subjects which will be addressed are the concept of the shape of the earth; the concept of the sun, the phenomenon of the change of the day/night cycle; and the explanation of floating & sinking of solid objects in the water.
Moreover the students will learn how to apply the scientific method in order to evaluate their beliefs concerning the above phenomena.

Purpose of the Research

In science teaching we focus on activating students' minds and usually we neglect their emotions. Fairy tales and storytelling have been used for centuries as an effective teaching tool mainly because they activate emotions. FAnTASIA project combines storytelling, scientific method (rational thinking) and AR technology (to represent scientific models).

Science Concepts Augmented in Fantasia Fairy tale Book

The Shape of the Earth

FAnTASIA investigates primary school children's conceptual knowledge about the earth. Children will come to understand that the earth is a sphere only after the presuppositions that gave rise to their initial models have been reinterpreted through the project activities.

Mental Models of the Day/Night Cycle

FAnTASIA investigates primary school children's explanations of the day/night cycle. A theoretical framework is outlined which explains the formation of initial, synthetic, and scientific models of the day/night cycle in terms of the reinterpretation of a hierarchy of constraints, some of which are present early in the child's life, and others will emerge later out of the structure of the acquired knowledge.

Floating and Sinking

FAnTASIA investigates primary school children's explanations about sinking and floating. Following the FAnTASIA activities students understand the phenomenon of floating and sinking as a property of the matter the bodies are made of.

Workshop Objectives

The main objectives of the Workshop are to promote and raise awareness about the FAnTASIA Educational Kit and the FAnTASIA app and to convince individual end-users to use it to enhance their learning experience.

Methods

Frontal lecture for the presentation of the Open Educational Resources (OER) developed by the FAnTASIA partnership.

Self-directed hands on activities in small groups following the Fairy Science Self-training Manual and using the Fairy Tale in Book format and the FAnTASIA app on a mobile device.

Sharing of new knowledge and exchange of experiences between the groups.

Brief Outline

12:00 – 12:15 Presentation of the Project

The facilitators will offer an overview of the project and a more detailed presentation of the available OER for primary education.

12:15 – 13:15 Hands-on activities with the FAnTASIA Educational Kit

Participants will engage in activities suggested in the Fairy Science Self-training Manual and using the Fairy Tale in Book format and the FAnTASIA app on a mobile device.

13:15 – 13:30 Evaluation feedback by the delegates

Discussion will follow to discuss with the delegates their experience and how they think the FAnTASIA Educational Kit can be used in formal learning settings (schools) and informal learning settings, e.g. home, science museums, outdoors etc.

Follow up

All project intellectual outputs and research findings will be publicly available at the project website: https://fantasia.ucd.ie/

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RoboPisces: innovative educational ROBOtics strategies for PrImary SChool ExperienceS

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Project Description

The RoboPisces project is a collaboration among Universities

- Università Politecnica delle Marche
- University College Dublin
- University of Latvia
- University of the Aegean

and Primary Schools

- Istituto Comprensivo "G.Solari“
- MRC St. Paul's Bay Primary
- Osnovna skola Titusa Brezovackog

to integrate Educational Robotics in the classrooms aiming at reinforcing students' school performance in STEAM and their digital competencies.
Two short-term joint staff training events entitled “Educational Robotics to Teach IoT and Marine Robotics at the Primary School” and “Design of Excellent Educational Robotics Courses with Open Education Resources” provide teachers with the necessary knowledge and resources to work on the RoboFish toolkit and implement the RoboPisces Educational Curriculum in their schools.

The project develops a curriculum on educational robotics and marine environment which is implemented in the partner schools using “Basic kits” (first year) and “Advanced kits” (second year). The Advanced kit is a Fish Robot that students can build and program! Teamwork, imagination, technical skills, digital competencies and knowledge on STEAM must be fully exploited to achieve the goal!

Benefits

The benefits for the students are:

- enhanced engagement in STEAM subjects learning and enhanced awareness of science and technology themes;
- improved digital skills;
- development of computational thinking;
- reduced school failure;
- increased attractiveness of STEAM-related and blue careers, for boys and girls;
- increased environmental awareness about the ocean themes.

The benefits for the School Community are:

- reinforcement of the positive and proactive approaches towards innovative practices;
- integration of Educational Robotics and Open Educational Resources in primary education;
- matching skills requirement for the labour market (digital economy and blue economy);
- increased awareness of the need to teach all students digital skills, in order to make them able to operate safely and efficiently in a modern work environment;
- preparedness of schools and teachers to adapt educational practice to an ever-changing multicultural school population;
- extended knowledge on the impact of educational robotics approaches.

The benefits for School Leaders and Teachers are:

- reinforcement of the teachers' teaching and technical skills;
- improvement of the quality of the teaching methods to ensure technology enhanced learning process;
- raising awareness of education best practices based on robotics approaches, including the European Educational Inclusion Best Practices;
- exchange of good science educational practices at EU level;
- improvement of the teaching performance through friendly competition and good practices shared with the other partner schools.

Workshop Objectives

The main objectives of the Workshop are to promote and raise awareness about the project Open Educational Resources and to convince individual end-users to adopt and/or apply the results in their educational settings.

Methods

Frontal lecture for the presentation of the Open Educational Resources (OER) developed by the RoboPisces on the topic: "Educational Robotics to Teach IoT and Marine Robotics in Primary Schools".

Presentation of the Greek Case Studies: a) the study in two public primary schools in East Attica and b) the study in a private school on Rhodes island.

Hands on activities in small groups with the Basic RoboFish Kit under the guidance of the facilitators.

Sharing of new knowledge and exchange of experiences between the groups.

Brief Outline

12:00 – 12:15 Presentation of the Project

The facilitators will offer an overview of the project and a more detailed presentation of the available OER for primary education.

12:15 – 13:15 Hands-on activities: "Build your own Robo-Fish"

The core of the Workshop! Participants will build their own Robo-Fish in small groups using the Basic Robo-Fish Toolkit under the guidance of the facilitators.

13:15 – 13:30 Evaluation feedback by the delegates

Discussion will follow to discuss with the delegates their experience and how they think the RoboPisces curriculum could be integrated in their school environments.

Follow up

All project intellectual outputs and research findings will be publicly available at the project website: https://www.robopisces.eu

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