

# **Enhancing the Human Experience of Learning with Technology**

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distance & networked education

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## Introduction

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## TRANSITION OF PRIMARY AND SECONDARY EDUCATION IN CROATIA TO ONLINE SCHOOLING: CHALLENGES AND NEW INSIGHTS

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### Abstract

In the school year 2019/2020 during online schooling, 11 educators – teachers, head teachers and pedagogues kept reflective journals about their practice for three months, during which time they also participated in focus groups and individual sessions. Valuable data obtained through systematically conducted qualitative research led to the formulation of questionnaires for teachers, head teachers and parents, which were delivered at the end of the school year in July 2020. More than 26 000 responses were collected. Taking a phenomenological perspective, this paper provides snippets into challenges faced by educators during online schooling and highlights their need for ICT-related education in Croatia.

**Keywords:** online schooling, COVID-19 and education, content-driven learning, Croatia

### Introduction

Online education has been the subject of research for a number of decades, including the issues of openness, access, organisation, motivation, delivery methods, etc. However, the outburst of the COVID-19 virus in spring 2020 led to the transfer of complete national educational programmes to virtual environments, which gave distance learning a whole new dimension. By April 2020, 107 countries worldwide had closed their schools to prevent the spread of the COVID-19 virus pandemic and over a billion pupils were unable to attend classes at their schools (Viner et al., 2020; Azevedo et al., 2020). Croatia was no exception. On 11 March 2020, the Ministry of Science and Education issued a set of guidelines instructing the schools on preparatory activities concerning access to online platforms and the creation of online classrooms, thus ensuring that all teachers and head teachers received some instructions on online learning prior to its commencement. As of 16 March 2020, Croatian primary and secondary education was conducted in an online environment,

and for the majority of pupils, it remained carried out in such manner until the end of the school year. For pupils in lower primary grades (aged 7 – 11) educational programmes were broadcast through national television and individual communication channels between teachers and parents were established. Upper primary grade pupils (aged 11 – 14) and secondary school pupils (aged 14 – 18) were enrolled in virtual classrooms on various digital platforms, namely MS Yammer, MS Teams, Loomen and Google Classroom.

During the period of online schooling (16 March – 26 June), especially in its early stages, Croatia experienced an extreme form of social distancing. All events were banned and people took recommendations seriously by staying at home and avoiding social gatherings. Furthermore, most of the companies, which had the necessary resources, encouraged their employees to work from home. As a result, many parents had to balance their working from home with their children's online schooling. It is noteworthy that the massive fear produced by the pandemic (Strong, 1990) was enhanced by an earthquake of magnitude 5.3 Mw, which hit Zagreb and the surrounding region on 22 March.

In addition to the support provided by the Ministry of Science and Education, the Croatian Academic and Research Network – CARNET played an important role during the online schooling. CARNET has been enhancing the digital transformation of education in Croatia over the last two decades through various projects, such as e-Islands, Schools 2.0, e-Schools pilot project and an ongoing e-Schools programme. Due to a historically unprecedented situation concerning online primary and secondary education, by the end of March, CARNET had initiated research with practitioners in order to monitor and evaluate the online schooling that was taking place.

## **Two lines of research**

Due to the novelty of the situation, a grass-roots approach was taken from the very beginning of the online schooling. CARNET contacted teachers, pedagogues and head teachers, invited them to keep reflective journals and participate in action research, which was aimed at developing reflective practice about the unprecedented teaching that took place. At the end of the qualitative research (also the end of the school year), a quantitative research was conducted, through which 26 871 responses were obtained from teachers, head teachers and parents. The mixed methods research design was based on the exploratory sequential approach, in which conclusions of qualitative research are generalized with the help of quantitative research (Sekol & Maurović, 2017).

In the qualitative research strand, conducted from March to June 2020, eleven educators regularly kept reflective journals and participated in focus groups and individual interviews. Participants, practitioners who were at the same time reflective researchers of

their own educational practice, had been collaborating with CARNET on earlier projects. Over 220 pages of journal entries were collected and 13 focus groups and dozens of hours of individual interviews were held. This type of qualitative research provides insight into the actual practices of educators without the mediating lenses of external researchers, allowing practitioners to talk about topics they consider important at a pace that suits them (Meth, 2003). Reflective journals or research journals are a written trace left by practitioners during the research process, detailing what they do and why. During the implementation of the qualitative research, CARNET systematically monitored the journal entries and coded them using a phenomenological approach – identifying topics that proved important to the practitioners themselves, of which the most important are discussed below. A total of twenty topics were recorded and 564 citations were coded.

Quantitative research was carried out in July 2020. This research line aimed to verify the conclusions of qualitative research with a specific goal of gaining better insight into the infrastructural and educational needs of CARNET users related to digital technologies. The questionnaires were based on topics that proved to be most relevant during the qualitative research. In the questionnaire for head teachers, the topics were related to the organization of online schooling, communication and cooperation, and support. The questionnaire for teachers dealt with the topics of virtual classrooms, communication and cooperation, and conducting online teaching. Finally, the questionnaire for parents was divided into topics of online schooling, communication and collaboration, and support. The online questionnaires were sent to all primary and secondary schools in Croatia through CARNET's regular channels. In total, 26 871 responses were collected, out of which 20 717 were collected from parents, 535 from principals and 5619 from teachers.

This paper will address issues of transition of primary and secondary education in Croatia to online schooling and provide general implications for non-adult distance learning following phenomenological approach (Merleau-Ponty, 2004), namely – covering those topics that emerged as the most challenging to practitioners. In this respect, the paper is grounded in the corporeality, temporality, relationality and spatiality of human practise (Merleau-Ponty, 2004; van Manen, 2016), or in simpler terms – it will highlight the importance of body, time, others and the world as presented by practitioners themselves (Sohn et al., 2017). These existential givens were in the focus of reflective journals as the fear of the virus and the sense of an isolated *body*, detached from its usual social environment, prevailed. Moreover, the problem of *time* management in an online environment, with all its pedagogical implications, led the participants to write and talk about the *physical, emotional and psychological pain* they endured, especially *in relation* to the workload with pupils that was inadequately managed, which, in some cases, led to

great fatigue, demotivation, isolation, loneliness, and, more extremely, burnouts in the case of teachers or depression in the case of pupils.

The paper argues that, with minor advances in ICT programmes offered at teacher training courses, the abovementioned challenges could be overcome or mitigated, not only in extreme, but also in normal circumstances. On the basis of the lived experience of the research participants, we will highlight their need for stronger implementation of ICT modules in teacher training programmes. However, we will not go into a detailed analysis of these programmes due to the focus of this paper on challenges of online schooling during the pandemic.

### ***Virtual schooling – real time and space problems***

The Guidelines issued by the Ministry of Science and Education included many instructions for head teachers, such as selection of one virtual platform for the whole school, organisation of the virtual staff room and virtual classrooms, but there were school procedures that were not covered by the Guidelines. Many head teachers expressed their puzzlement on how to organise classes for the lower primary grade pupils, pupils with special needs, pupils in branch schools and those with inadequate infrastructure. In some areas of Croatia are still not covered by the internet connection and in some cases pupils' families did not own necessary computer equipment. Quantitative data showed that 4% of the parents stated that their child did not have necessary equipment at home, while further 26% parents reported that equipment had to be shared among family members. All this led to some schools organising schooling in school premises. There was also a question of non-teaching school employees and their duties during online schooling – whether janitors, cleaners, accountants, secretaries should come to school, what can they do from home, etc.

Teachers' journals often speak about problems with time management. Though all Croatian teachers attended some online courses during curricular reform, a significant majority did not have any experience in creating or managing online courses. As a consequence, most teachers were not aware of the importance of structure in their online classes which can be achieved through activity plans, schedules, assignment deadlines or communication plans. Journals show constant boundaries and accessibility issues.

*“Assignments are constantly arriving, 7 new groups on Viber and WhatsApp, and their motivation is falling day by day. I'm getting desperate. I spend all day reading and sending, explaining and replying to messages. I think this is solely because pupils don't have an authority figure in front of their eyes, do not see the teacher physically, so they don't have the impression*

*that the teacher is reading and reviewing the assignment.” (Teacher 3, a reflective journal entry, 24 March 2020)*

During focus groups, teachers complained of never-ending homework corrections, and their writings showed that they stayed up late every night to finish corrections and prepare materials for the following day, which they sometimes failed to do. Some of them complained about physical pain due to constant sitting and time spent in front of a screen. Sometimes they also got angry about receiving pupils' emails late in the evening or during the night and they felt obliged to answer them immediately. In all journals, teachers expressed their dissatisfaction with the amount of work and time needed for online schooling and often found pupils accountable for this workload:

*“Endless browsing of virtual classrooms, replying to emails, messages, updating data, helping my biological children with their tasks, searching for an adequate story for an extracurricular activity and, in the end, I forgot about the Zoom session.” (Teacher 2, a reflective journal entry, 19 May 2020)*

In this and other entries, the problem, from the teachers' perspective, seemed to lie in the pupils' perception of the nature of online classes – that they could pose questions any time, send their work late and expected immediate detailed feedback on the assignments they handed in. Also, the boundaries between private and professional were often blurred in their journal entries.

### ***Letting go of control – problems with (online) teaching methods***

Questionnaires showed that the majority of teaching was based either on sending basic presentations to pupils or asking pupils to complete the assignments found in their textbooks. Less frequently teachers used other methods of delivery, such as presentations enhanced with audio or video as well as occasionally using interactive materials in homeworks. Most commonly, the teaching was asynchronous. The result could be described as a content-driven self-study approach (Teräs et al., 2020) that seemed to be a dominant teaching method. Of 5619 teachers who responded, 30 % stated that they sent presentations to their pupils once a week and further 27% did the same several times a week. At the same time, 27% of the teachers instructed their pupils to read parts of textbooks and answer several text related questions once a week, while around 20% did the same several times a week. The following quote from the qualitative study illustrates this approach:

*“Browsing the content on Teams, I get the feeling that everyone's tired, the tasks are no longer as creative as in the beginning, teachers use what we said we would avoid – assign the task, pupils should read something, answer the*

*questions, write the answer down in a notebook, take a picture and send it back.” (Head teacher 1, a reflective journal entry, 7 May 2020)*

Some teachers did explore creative ways in order to enhance their teaching. Teachers’ journal entries revealed that, as time passed, some of them grew more confident and started using more varied tools and techniques.

*“I made a PowerPoint presentation and added sound to it, that is, my voice. (...) but the challenge was recording the voice. I recorded the first sentence at least 7 times, :). I was surprised at how complex it actually was. One should think very carefully about what and how to say something, how to be clear, accurate, moderate, but not boring. (...), but I decided that I would not go on indefinitely because, at some point, I need to stop and send the children learning material.” (Teacher 4, a reflective journal entry, 18 May 2020)*

However, the earlier mentioned workload was a constant issue. Responses from parents’ questionnaire revealed that more than 30% of parents spent a couple of hours daily helping their child with school assignments, while more than 70% reported helping their child in general. The workload, the amount of time teachers spent preparing classes and marking assignments, and the time parents spent helping with online schooling all testify to an enormous amount of content that teachers attempted to transmit. Furthermore, it testifies to the control teachers were used to having in the real classroom and to their attempt to retain it in an online environment.

The question of control became particularly evident in evaluation and assessment. In normal circumstances, summative assessment through written and oral exams based on the testing of factual knowledge prevails in Croatia. Curricular reform included training programmes for teachers with the goal of raising awareness of and promoting the importance of formative or assessment for learning (AFL). Unfortunately the programme was obstructed by the massive teacher strike in autumn 2019 and then the pandemic. A physical distance caused the participants to question the objectivity of the assessment process and results:

*“I wonder to what extent the final grade (...) will actually be an objective presentation of the knowledge and abilities of each pupil?” (Head teacher 2, a reflective journal entry, 21 April 2020).*

### ***New communities of practice***

The challenges of online assessment also led teachers to rethink their assessment styles and to introduce new concepts and techniques. Many of them learned how to use online assessment tools such as Google Forms, but they also learned how to collaborate and develop rubrics together. One of the teachers who participated in qualitative research described the process of borrowing rubrics from a colleague and adjusting it to her classes:

*“The last two days I have corrected some of the essays, but I have been mostly concerned with adapting the evaluation rubrics forwarded to me by a colleague. So far, I have modified it twice because I needed slightly different elements and definitely different instructions for each class, and I remembered to forward the first modified version to my other colleagues so that they would not have to do all the work.” (Teacher 2, a reflective journal entry, 6 May 2020)*

This was one of many forms where teachers, head teachers and pedagogues were learning together. Questionnaires showed that around 70% percent of teachers and more than half of the head teachers accessed information on online schooling through collaboration with their colleagues, and journal entries are abundant with evidence of such practices:

*“This is where my colleague’s willingness to accept my idea came to the fore, and she used my work for her teaching (...). I must add that, in ‘normal’ circumstances, my colleagues and I did not have such forms of cooperation, but rather each of us did her own thing. Our previously mentioned good communication refers mainly to the transmission of information about pupils’ behaviour (...). Joint planning of teaching content rarely happened, something we are both responsible for. It is for this reason that I was extremely pleased with her accepting my idea of using joint material in working with pupils.” (Teacher 4, a reflective journal entry, March 2020)*

Parents’ answers also revealed that they mostly gained information about online schooling from homeroom teachers. Journal entries showed that collaboration with parents was especially important in lower primary grades where a parent was a channel between the teacher and the child. Parents were also a frequent theme of head teachers and pedagogue’s journal entries and a topic of focus groups. In one of the entries, a pedagogue writes:

*“My goal was to connect better with parents, invite them to cooperate, understand and support us in the new situation. According to the feedback from class teachers, parents accepted my request well and were encouraged*



*to come in person if they wanted.” (Pedagogue 3, a reflective journal entry, 3 March 2020).*

### **Project-based competence development**

Most of the participants of the qualitative research strand were from the schools that were involved in previous CARNET's projects: some of them worked in *digitally mature schools* (Balaban et al., 2018), and some were ICT enthusiasts and pioneers of ICT implementation in their schools. Therefore, it came as no surprise that reflective journals and focus groups revealed that participants who had extensive experience with digital technologies felt they had been prepared for a situation where all classes were conducted in a virtual setting:

*“Digital competencies that we developed in the training through the e-Schools pilot project significantly helped us, so we relatively quickly prepared for (...) communication with pupils and parents, and with each other.” (Pedagogue 1, a reflective journal entry, introductory part).*

*“Online classes did not surprise me, I felt completely prepared to accept all the challenges. Digital technologies have been something I have been living with every day for the last seven years, ever since CARNET's E-learning Academy. I develop my competencies every day out of personal curiosity, and inner motivation is something that always drives me. In online teaching, I didn't expect problems working with technology. The human factor turned out to be a challenge at every step of the way.” (Teacher 1, a reflective journal entry, introductory part).*

However, journals from participants who had no previous project experience revealed no such confidence. Moreover, it was confusion and insecurity that were recorded in the first weeks of online schooling.

*“Online schooling found us all relatively unprepared. Unprepared in terms of teaching methods for distance learning, less in terms of digital technologies. (...) we quickly learned how to work in Teams. First, we educated teachers from lower primary grades, and they helped subject teachers. (...). The first week of classes was chaotic. We didn't know what to do, but as time went on, the teachers, the school improvement service and the principal coordinated and arranged the educational work. Students and parents needed to adjust a little more.” (Pedagogue 2, a reflective journal entry, 30 March 2020)*

*“Fear and insecurity are felt in the teachers. A few teachers who felt that they would not need digital skills are learning from more experienced colleagues.” (Head teacher 1, a reflective journal entry, 17 March 2020)*

Quantitative data show that these testimonies were by no means isolated examples of such insecurity. Though a significant number of teachers expressed they had no need for extra education (42% out of 5619 responses), in responses to an open question regarding specific support they needed, a recurring answer was that they would benefit from extra education on teaching methods in an online environment. What was highlighted in both journals and in questionnaire responses was a need to develop skills required for teaching in an online environment.

## **Conclusion**

In this paper, we presented issues regarding online schooling that turned out to be the most relevant from the perspective of teachers, pedagogues and head teachers. The findings show that ICT-related confidence levels of all these groups of educators depended on their previous personal or school experience. However, the data also showed that, experience notwithstanding, the workload led to feelings of isolation, anger, burnout and sometimes even physical pain. The workload was largely related to the content-driven self-study method the online schooling was based on, and the control-centred educational system. Research findings did not only provide valuable insights into the weaknesses of online schooling, but of the Croatian educational system in general. Project-based professional development is of particular benefit for participating schools, but it is also discriminatory as not all schools have equal access to resources and the ability to apply for or participate in such projects. Furthermore, the fact that teachers shared similar workload problems leads to the conclusion that future and in-service teachers in Croatia need further training that will endorse innovative teaching and assessment methods in the virtual, but also the real environment. Finally, sharing and collaboration models developed during online schooling indicate the importance of informal learning and the often underestimated role parents have in the Croatian educational system.

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## **“I CAN DO THIS – BETTER THAN I THOUGHT” – INSTRUCTORS’ EXPERIENCES OF THE DIGITAL SUMMER TERM 2020**

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### **Abstract**

With the Covid-19-induced situation in the summer term 2020, instructors at campus universities were confronted with the need to radically modify their face-to-face teaching practices. Switching to teaching fully online, they needed to cope with an oftentimes little chartered pedagogical territory, adapt to online distance education practices and do so in a very short time. As part of an institutional evaluation of the summer term, this study draws on the responses of  $n = 29$  instructors who reported zero years of prior experience with digital teaching at the outset of the summer term at one German university. It provides evidence on the kinds of tools that they used in their teaching, the most important learning experiences they identified and the elements they would like to modify in their future teaching.

**Keywords:** Online Learning, Emergency Remote Teaching, Instructors, Interaction, Support Structures, Higher Education

### **Introduction**

With the global spread of the COVID-19 pandemic, the year 2020 marks a turning point in all aspects of everyday life; also including higher education (Marinoni, van’t Land, & Jensen, 2020). Campus universities across the world resorted to full online teaching and learning during the summer term, adopting emergency remote teaching as a way to cope with this global health threat (Hodges et al., 2020). Numerous ad hoc initiatives were created to support instructors in higher education to carry out their online teaching (for example, EDEN, 2020; Hochschulforum Digitalisierung, 2020), focusing on how to support students, implement different educational technologies or develop strategies for online teaching. However, Hodges et al. (2020) also stress that emergency remote teaching is different from long-term conceptualized and implemented online learning as it had been on the steady rise prior to Covid-19. Switching to teaching online can be a challenge for instructors as such (Adnan, 2018), which was exacerbated by the urgency of the situation

in March 2020. The group of instructors,  $n = 29$ , that is in the focus of this study reported to have zero years of experience with digital teaching, which makes them an interesting group to study when it comes to transitioning from face to face teaching to fully online settings. This investigation, part of an evaluation study of the summer term 2020 at one Germany university, revolves around their usage of digital tools, major perceived personal learnings and their intentions to modify course elements.

Briefly touching on some differentiating elements between online learning and emergency remote teaching, we delineate the study context, the approaches to data collection and analysis and then present our findings before discussing them against the background of the study limitations.

### ***Designing online learning and teaching online***

Following from the ADDIE model, Bates summarizes standardized good quality in the design of online courses to rely on "clear learning objectives, carefully structured content, controlled workloads for faculty and students, integrated media, relevant student activities, and assessment strongly tied to desired learning outcomes" (Bates, 2019; p.130). In contrast to face to face courses, online courses are closely associated with shared responsibilities that is the design oftentimes being in the hands of instructional designers and the actual delivery carried out by instructors (Rapanta et al., 2020). The demands and subsequent tasks that arise for instructors are depicted according to the progression of an online course (Salmon, n. d), indicating the complexity of teaching online. However, Baran et al. (2011) conclude in their review on the roles and competences in online instructors that "there is the tendency for online teachers to lean to their traditional teaching practices as reference points, the affordances and limitations of online environments will pose new challenges for them as they try to operate within their existing sets of beliefs and practices" (p.435), calling to professional development programs to take this into consideration as well as offering support during this potentially transformative learning experience.

### ***Designing emergency remote teaching***

In principal and in pursuit of pedagogical goals in the higher education classroom, the demand for high-quality teaching has not changed with the Covid-19 pandemic. The conditions had, however, and oftentimes did not allow for an extended design and course implementation phase (Hodges et al., 2020). Furthermore, instructors needed to both develop and deliver the courses—oftentimes also requiring to make themselves familiar with tools that they had not used previously (Brooks & Grajek, 2020; Rapanta et al., 2020). Developing and finding their "teacher-self" (Baran et al., 2011; p.435) in the online classroom might have been even more challenging that it would have been under regular circumstances. With numerous pieces of advice being offered to instructors (e.g. Bates,

2020) and ad hoc publications being made available to instructors (e.g. O'Keefe et al., 2020), instructors in Barton's (2020) perceived field-specific intended learning outcomes at risk as well as resorting to teaching modalities less student-centred.

## **Research Questions**

The study addresses the following questions, aiming at providing insights that can work into further service provision at the respective university and other institutions alike.

- Which digital elements did instructors employ in their teaching?
- What do instructors report as their most important learning experience?
- What elements of their online teaching do they want to modify?

## **Institutional Context**

The institution serving as the case example of this study is a large, comprehensive German university. The institution's e-learning support and consultation unit is centrally organized, complemented by an e-learning coordinator in each of the five faculties. For the past eight years, the e-learning unit has grown in staff numbers due to a national large scale funding project targeted at improving teaching quality (Bundesministerium für Bildung und Forschung, 2020); this also enabled extended support and consultation services to the instructors. Against the backdrop of the immediate need to collectively implement online learning formats across the university in the spring of 2020, an additional ad hoc support program was established. This included the possibility for instructors to obtain small-scale funding for equipment and student assistants, receive support in the design and implementation of their digital course format and other services related to quick-starting online teaching.

## **Method**

In the second half of the summer term 2020, a survey with both open and closed questions was sent out to 371 instructors at the university who had previously either received support in the context of the long-term teaching development project and/or in the ad hoc support program from March 2020 on. The survey was distributed via the university learning management system; clearance on data protection was obtained from the institutional data protection officer. The survey was primarily motivated to receive concerted feedback from the instructors on the services offered through the e-learning support unit as well as understanding their prospective needs in further digital or hybrid semesters. After evaluation of the responses obtained,  $n = 88$  cases were considered for descriptive analysis; out of those 79 answered all questions, and nine the major part of the survey. For the present study, we focus on the answers of  $n = 29$  instructors who reported to have zero years of experience with digital teaching. We can therefore assume that the experiences

reported by this group primarily stem from the digital summer term 2020—unless they gained experience with digital teaching in the winter term 2019/20 or acquired knowledge on the topic—and that their answers directly relate to the specific situation.

In this contribution, we present selected results from the closed and open questions from the survey, the latter were analysed using an inductively developed coding frame (question 2) and a deductive coding scheme (question 3) that was applied to the answers using the tool QCAMap (2020).

## Results

Out of the  $n = 29$  participants, seven are professors (24%), six are (tenured) senior researchers (21%), ten are research associates (35%), three full time lecturers (10%), and another three indicated their position as "other" (10%). With 14 participants (48%) about half of the group is affiliated with the Faculty of Humanities, Social Sciences and Theology; this also being the largest faculty at the university. The other faculties had at least one participant in the sample. The teaching experience in years that participants reported to have, ranges from 0 to 20, as displayed in Table 1.

Table 1: Teaching experience in years ( $n = 29$ )

Teaching experience (years)	Absolute	Relative
0	1	3%
1 - 3	5	17%
4 - 7	4	14%
8 - 11	7	24%
12 - 15	2	7%
16 - 19	4	14%
+ 20	6	21%

Via the central e-learning support unit, the university offered an ad hoc support program in the beginning and throughout the summer term 2020 as stated above; all of the 29 instructors received some form of support from this program. Following this basic information, we now address the three research questions.

### ***Which digital elements did instructors employ in their teaching?***

Participants were asked to name course formats that they received support by the e-learning unit for, the first format that was indicated serves as an example as to which digital elements tools instructors used. The lecture ("Vorlesung") was mentioned 14 times (48%), followed by nine seminars ("Seminar", 31%). Two formats were indicated as "other" (7%), while three participants (10%) did not state the course format, and one (3%) skipping this question.

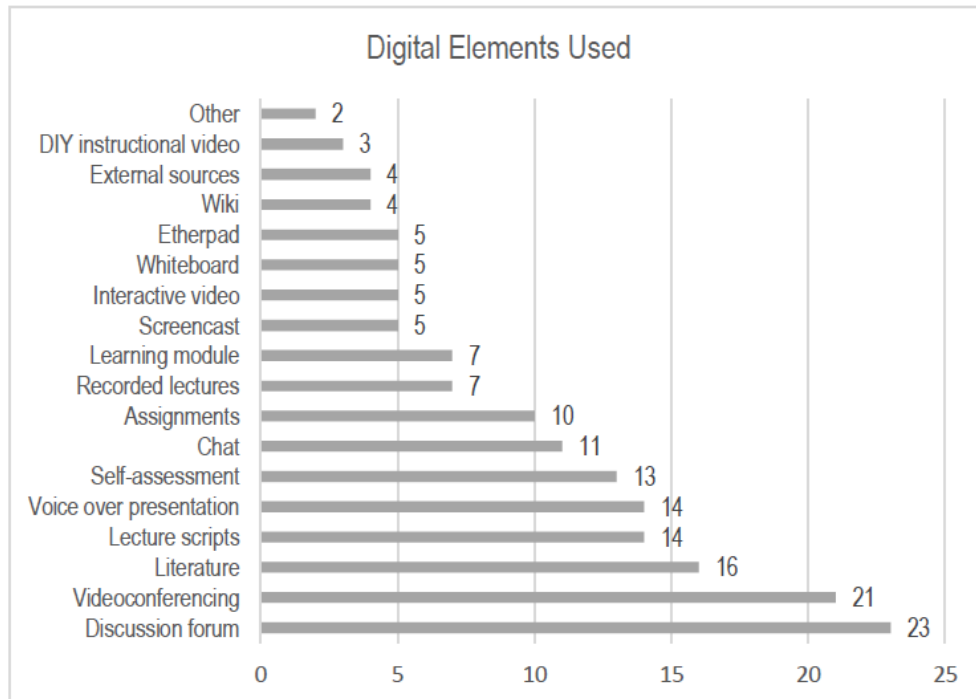


Figure 1. Digital elements used by instructors within one of their course formats, multiple choice (n = 28)

As depicted in Figure 1, discussion forums and videoconferencing were the two elements employed overwhelmingly often, that is in 75% and 79% of the teaching formats. It is also evident that the range of digital elements that are available within the institutional learning management system and/or are being part of support services, e.g. video production, are being employed by instructors.

### ***What do instructors report as their most important learning experience?***

Answers to this question are elicited through inductively coding the participants' responses, choosing phrases that were sometimes drawn directly from participants' quotes or choosing expressions close to their wording. Coding was conducted in German, as the remaining answers will be further coded for the German speaking context within the university. At this point, we also refrained from summarizing answers into larger categories; this will occur at a later stage.



Table 2: Inductive categorization of central learning experience, multiple coding

Category	Absolute Count
Little feedback from students	3
Personal contact cannot be replaced	4
Possibilities to organize and structure content in classes	5
High effort is needed	7
Little personal interaction	2
Videos are well received by students	3
Own capabilities	3
Digital teaching works	3
Applying digital elements	5
Reduce content and time	1
Strenuous	1
Absolute	37

Table 2 indicates that instructors realized that preparing for teaching online requires an effort, for example that it takes a long time to prepare videos, that simply "everything takes longer" and that answering to students' email was time consuming as students did not use the forum to ask questions. Topics related to interaction, feedback and the lack of personal, face to face contact were also developed from the material, including statements that it is difficult to transfer lively face to face discussions into the online classroom or that direct student feedback is lacking. However, instructors also commented that they learned about the functionalities of the learning management system (applying digital elements) and that online teaching works as stated in "worked better than expected".

### ***What elements of their online teaching do they want to modify?***

For this question, the participants' quotes underwent deductive categorization according to four main topics. These were provide content/lecture ("vermitteln"), activate ("aktivieren"), scaffold / communicate / organize ("betreuen / kommunizieren / organisieren") and evaluate / assess ("prüfen / testen"). These are the four central components used at the e-learning support unit to guide instructors in designing and implementing digital elements within their courses; grounded in Kerres (2001). As for the opposite of modification to be voiced, a fifth category was included with "Nothing", in case instructors wanted to continue without changes to their courses.

Table 3: Deductive coding of elements to be modified in further teaching

Category	Absolute
Provide content/lecture	7
Activate	9
Scaffold/communicate/organize	0
Evaluate/assess	0
Nothing	3

As depicted in Table 3, participants voiced their intentions to modify parts of their courses in regard to the provision of content or lecturing as well as activation of students. Against the backdrop of having sent out the survey in the middle of the semester, the fact that no one commented on evaluation and assessment is not surprising. Amongst the means that instructors want to employ in order to activate students, using interactive videos is included, as well as making more intensive use of (small) group work during synchronous sessions—and generally commented as "In fully digital offerings, I would integrate more interactive elements, in order to increase the personal touch". As for provision of content and lecturing, participants stated that creating "more/better instructional videos" or using screencasts is on their list.

## **Discussion**

Instructors in this study were faced with the necessity to switch from face to face teaching to teaching fully online- against the background of not having extensive experience in this area, if at all. About two thirds of them have over eight years of teaching experiences and can therefore be assumed to have established personal teaching patterns for face to face contexts (Baran et al., 2011). The instructors in this sample all sought support of some kind from the institutions ad hoc support program, indicating that they were aware of needing to either change elements of their teaching, develop course structures differently, or gain familiarity with digital tools.

When teaching remotely during the summer term 2020, the range of available digital elements in the learning management system was put to use, with discussion forums (communicate, organize) being used most frequently and the followed by tools related to lecturing and providing content, that is lecture scripts, literature—and videoconferencing. Videoconferencing is an interesting case, as it was perceived to be tiresome for long sessions but in further teaching, using small group activities in synchronous sessions was seen as one way to activate students. The ambivalence of videoconferencing is also noticed in Rapanta et al. (2020).

The central learning experiences that instructors had, occur on different levels, ranging from an improved self-efficacy regarding use of digital elements and online teaching ability to having experienced that effort—also including time resources—is much needed for and within online learning. Relating the perceived little interaction with students and the lack of immediate feedback to the elements that instructors want to change in their further teaching, the wish to "activate" students emerged prominently. Whilst the use of forums as a way to communicate with students was used in the summer term, to further foster communication as a part of interaction seems important (Salmon, n.d.). This might also entail to go back one step from information exchange to online socialization in order to set

the scene for ongoing interaction more profoundly. In turn, this means for supporting units to pay more attention to guide instructors in this endeavour and consider it in professional development offerings (Adnan, 2018; Baran et al., 2011).

## **Limitations and Conclusion**

The study presented here is a part of the e-learning support unit's evaluation of how instructors perceived the digital summer term and the services they sought in order to manage the transition from face to face to online teaching. Several limitations to this study exist that stem from the conceptualization of the survey and the number of participants. These need to be noted when evaluating the findings and the reach of the conclusions drawn from them. For example, the group of instructors in this study reported to have zero years of digital teaching experience; however, later questions of the survey indicated that they had, experiences with the use of digital elements within their teaching, such as developing learning modules, using screencasts or video podcasts. Thus, while zero years is reported, this does not equal zero experience as such. Furthermore, the sample size is very small and does not allow for generalizations; it rather provides an exemplary glimpse into how the transition to teaching online worked for this specific group. As the overall analysis of the evaluation is still in progress, we only employed a preliminary category system that still needs to be applied to the remaining participants' answers. This might also result in some categories changing or being modified.

With the pandemic most likely continuing for an indefinite time, instructors and institutions alike face the need to turn the summer 2020 emergency remote teaching into online teaching and learning that is based on established principles of pedagogy and especially drawing on those from the field of distance education (Zawacki-Richter, 2020). What seems to be vital in order to meet this need, is the provision of support structures for instructors so that the emergency remote teacher ultimately becomes an online learning facilitator—who can say about him or herself "I can do this - better than I thought".

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## **STUDENTS' PERSPECTIVES AND STRATEGIES ON STUDYING AT HOME IN TIMES OF COVID-19 LEARNINGS FROM PODCAST CONVERSATIONS AND AN ONLINE SURVEY**

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### **Abstract**

Since spring 2020, higher education institutions all over Europe and worldwide have had to quickly adapt to the new situation provoked by the outbreak of the COVID-19 virus. Most institutions have changed their study mode to pure online studies, with face-to-face studies in university buildings temporarily being abolished. Equally, other university facilities such as libraries had temporarily been closed, this meaning for most students that the major amount of study time was to be spent at their homes. In the dawn of a new academic year and with higher education institutions looking for new ways and strategies to cope with recent and future challenges, students' experiences and their reflections on their last semester should be heard and considered when planning the next ones. Two interview series released as podcasts and an online survey have aimed at collecting students' voices on their recent study experiences and their reflections on the future of higher education. Results indicate a high need of fostering self-organizational skills, an appreciation of a new flexibility brought about by digitization as well as concern for aspects such as social isolation and digital social presence.

**Keywords:** Podcast, Higher Education, Survey, Home studies, Online teaching, Digitization

### **Introduction**

Changes in people's everyday lives in spring 2020 have been prompt. Due to the worldwide COVID-19 outbreak, most governments have taken measures of social distancing, this including higher education institutions, with the consequence of most institutions quickly changing their study mode to pure online studies, with face-to-face studies in university buildings temporarily being abolished. Equally, other university facilities such as libraries had temporarily been closed, this meaning for most students that the major amount of

study time was to be spent at their homes, most interactions being digitally mediated and most materials digitally trans- and submitted. For the next semester, most institutions have either announced to offer another digital study semester while others are adopting a hybrid mode where some classes, laboratories etc. are taking place on campus – especially those where digitization has been difficult – and some are further digitally taught.

This recent and future situation challenges the more classical model of higher education with lectures and seminars being held in lecture halls and classrooms. Higher Education is at a turning point, where the higher education institution as a physical space where most learning and studying takes place can at least be questioned. Digitization has been discussed and embraced by different degrees by the institutions before the lockdown – it has now proven to be able to provide education even in times of crisis. All institutions have met the same challenges of allowing students to pursue their studies from any possible place, which in this case meant ‘home’. Some measures have already been loosened, with students being able to physically meet and learn with fellow students and with accessing resources in libraries and studying in other places such as libraries or cafés. The recent debate is thus not only on how to provide education via digital channels at all. It is also about if this is quality education enabling deep learning and social interactions, but also if all students can be reached this way.

This paper provides insight into findings of two interview series released as podcasts and a quantitative survey, both asking students about their study experiences when studying at home in their first digital semester. We will describe the research methodology, formats and limits (section 2), give an insight into the findings (section 3) and provide a summary and outlook (section 4) on how we will proceed with the project.

## **Research Methodology**

In order to collect and disseminate students' voices, we have conducted qualitative research by interviewing them on the subject of their recent study experiences with digital studies at home, those interviews being digitally recorded and documented, and then being edited and released in two podcast series (“Studium im Shutdown” and “NextNormal”). Moreover, we have conducted an online study at DHBW (Baden-Wuerttemberg Cooperative State University) asking students about evaluating their digital study experience of the past few months, this quantitative data complementing the qualitative material gained by the podcast series.

For the podcast interviews, our research design is thus a qualitative research set with half-structured interviews (a rough interview guide with pre-set questions and keywords serving as a basis for the conversations). These interviews can be analysed by qualitative

## Students' Perspectives and Strategies on Studying at Home in Times of Covid-19 Learnings from Podcast Conversations and an Online Survey

content analysis (Mayring, 2015) in order to find different answering categories. Accordingly, we analysed the audio material to extract main topics in order to collect, allocate and code propositions and find categories for them. The according code tree can be visualized as follows:

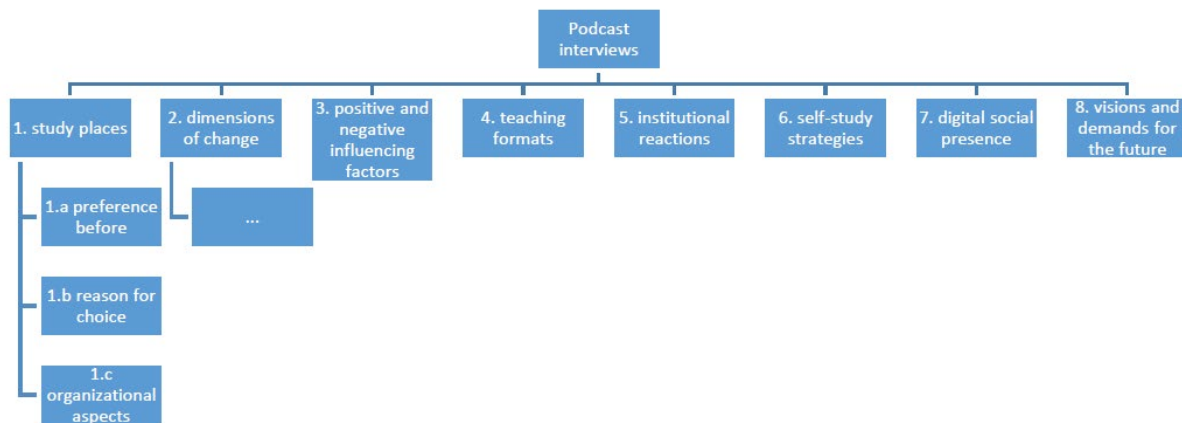


Figure 1. Code tree for the podcast analysis

### ***The Podcasts: “Studium im Shutdown” and “NextNormal”***

On April 6, 2020, the first episode of the Podcast “Studium im Shutdown” (Studying during Shutdown) aired, followed by two new weekly episodes average. Up until now (15<sup>th</sup> of September 2020), fifteen episodes have been released. The interview language is German, having been individually conducted and released with students studying and living in Germany, a certain diversity concerning disciplines and study environment being intended.

After fifteen episodes of “Studium im Shutdown”, we’ve noticed that students have become more used to the recent situation: it has become the new normal. Due to the research team being involved in different EU projects, we’ve decided to contribute to a more European educational debate on the future of higher education with a second podcast, taking a more visionary and strategic approach, asking and envisioning the “NextNormal” of European Higher Education. The first episode of the second Podcast “NextNormal – WeStudy@Home” aired on July 27, 2020. Up until now, three episodes have been released and five interviews have been conducted. The interviews have been recorded and released in English and with students studying and living in different EU member states, the contacts being provided by ESU, the European Students’ Union. The setting is a group discussion with two presenters and at least two students studying in each country. The ESU being the organization representing national student unions on a European level, a lot of the interviewees are engaged in student unions themselves, but not exclusively.



While the first interview setting allowed to get more personal insights into how students individually coped with a new situation, the future perspective is the central one in the second format.

### ***Quantitative Survey***

In the summer semester of 2020, we have conducted a survey on students' perceptions of and dealing with the current teaching during the Corona shutdown. The research setup was a quantitative online survey with open- and closed-ended questions sent to students who took part in classes that our institutions' Education Support Centers (ESC) had recommended as positive examples of digital teaching. This quantitative data can be used to complement and contrast the qualitative findings of the qualitative interview recordings. The online survey comprised 42 questions and was distributed via the online survey system EvaSys. Around 400 students were contacted, of whom 157 participated in the survey.

### ***Limits of our data and research***

For the qualitative interviews, it is important to notice that interviewer and interviewee have agreed that their contents will be publicly released as podcasts, with possible implications on the profiles and propositions of the interviewees. Answers of the interviewees might be influenced by them knowing that those will be broadcast – thus potentially taking a milder more diplomatic tone. We can also suggest that the students interviewed are more familiar and comfortable with talking in public and have prepared the interviews with some questions provided beforehand. Similarly, we must suggest that students coping less well with the situation might be less inclined to do a podcast interview with us than those who do. However, we've noticed that the students interviewed often talk about other students facing special challenges and coping less well with the situation, their interests thus being at least partly present.

We have complemented those findings with quantitative data and answers to open-ended questions from an online survey, its limits being the pre-selection of classes whose students were being interviewed, all studying at the same kind of institution of dual studies. Altogether, the three research setups and formats represent different approaches to collecting and making student voices heard in the debate on studying at home and perspectives on the future of higher education. Our research must thus be seen as an explorative thematic scouting rather than claiming for representativity.

### ***Research Findings***

When analysing the podcast interviews, certain subjects emerge as crucial – those being about study strategies, study locations, digital teaching formats, social presence and expectations to higher education institutions. These subjects comprise diverse aspects and

should serve as a basis for further research. Complemented by the data from the student survey, we can describe an explorative topical framework of students' study experiences and visions when studying at home.

Research conducted before the lockdown on students' preferred "places of study" has indicated that most students prefer to study at home – with a smaller but increasing part of students studying almost completely in the buildings provided by higher education institutions such as libraries, those being the most frequented (Vogel et al., 2018). Studying at home is mostly preferred due to the flexibility of time. The library represents, for most students, not a place of learning and studying, but of getting access to study resources. Other reasons for studying on campus mentioned are the possibility of doing group work and social interactions, but also that it might be hard at home to find the necessary calm to concentrate and focus (ibid.). The cited study focuses on the domain of "self-study", meaning everything taking place additionally to face-to-face study. In the recent situation, both self-study and face-to-face study have taken place at home for most students. However, research has indicated that even when studying at distance, the idea of a physical campus remains important in material and symbolic ways (Bayne et al., 2013).

While several students in the podcasts indicate that they have preferred to study at home already before the lockdown, others say that they have done all their studying in the library, with several students switching locations in-between. Library and campus are preferred for helping to structure the day and for the access of resources, but also for social contacts. When at home, most students now have a specific location for studying and try to separate it from other parts of the apartment dedicated to other such as leisure activities. Other interviewees indicated that they try to switch locations in order to simulate moving on campus or that they reorganized their shared apartment in order to study with other student housemates. Concerns are issued concerning the need to concentrate and not being able to freely move at home. For example, a Teaching student claims that "one of the biggest personal burdens in the recent situation is to have my own working space at home" (Studium im Shutdown, episode 13, 20:28, translated from German).

When analysing the "dimensions of change", lots of aspects are mentioned, such as concerning study contents and one's personal study organization and curricula. The one featuring most prominently, however, is the aspect of social and psychological well-being, this being a crucial subject to most students interviewed. Students are missing opportunities to make new contacts, to exchange ideas or just to spend some time together. A Psychology student states that "usually, in a beginning of a new semester, making new contacts is very valuable, and this is not possible right now" (Studium im Shutdown, episode 5, 22:45, translated from German). Several students indicate that their workload

has significantly risen in the past months, partly due to newly introduced assignments or new examination formats such as portfolios. It was indicated by several student representatives that the visibility of and the interest in student participation and representation has risen in the past months.

When it comes to “positive and negative impacts on the study experience”, digital competences are seen as crucial in successfully participating in online learning. More flexibility in scheduling lectures is seen as positive by some students. However, a lack of motivation and productivity is observed by several students. Some of them indicate that their research is more difficult to conduct due to the lack of access to different resources. Also, several students indicate that discussing and debating study subjects with teachers and fellow students outside of class is much harder when studying online. In the European context, it has been mentioned several times that a lack of sufficient internet connection is excluding students from successfully pursuing their studies. A Romanian Engineering student mentions that “there are many students that come from rural areas that do not have the necessary reception, so the accessibility to higher education during the past three months was [...] nonexistent” (NextNormal, episode 1, 8:30).

In the online survey, accordingly, several students mentioned in the open-ended answer section that the appropriate technical equipment and internet connection was crucial for following classes – and also that the lack of it, for example on the side of teachers, prohibited successful teaching and learning.

Research has found evidence that students prefer synchronous, face-to-face and interactive “online teaching formats” to asynchronous formats and rate them as more efficient (Ward et al., 2010; Skylar, 2009). Accordingly, participative teaching setups in the mostly constructivist light of ‘Media Education for Participatory Learning and Teaching’ are seen as a contemporary way of approaching current and future challenges of higher education (Mayrberger, 2020). In a learner’s perspective of quality in digital learning, the learner is empowered by playing a more important role when it comes designing education (Ehlers, 2003).

As for the interviewed students, when it comes to study designs experienced, there is a big variety between more and less complex and interactive digital study setups. In the beginning of the interviews, there were a lot of positive reactions to how well studying actually worked. In the course of time, students have become more demanding and asked for more interactive learning environments, but also for reacting to students’ feedback on what suits their learning. Some also mention that they appreciate when a certain structure concerning lecture’s duration and time is ensured. Some students stated that other

students have experienced situations of overwhelming due to the lack of interaction with teachers and other students, such as a Belgian Anthropology student tells: “It was like they were disconnected from us. They just had that reflex [...] just do some work and send it to me, if you have questions, send it to me. They didn’t interact with us, they don’t teach” (NextNormal, episode 4, 22:35).

In the student survey, as for the forms of online teaching, a big diversity was observed: Most students have experienced online lectures with and without interaction, online blended learning formats and complete self-study. The average amount of self-study was estimated at 69%, this being rated neither very satisfying nor unsatisfying. When asked about the satisfaction with different forms of online teaching, the blended and interactive forms (interactive lecture, mix of online and self-study) were rated better than the non-interactive online lecture and pure self-study, this being rated the least favourable. However, 60.9% of students indicate that they learn less in this online setting than in a classical presence study setting. Several students indicated that video recordings of lectures and less interactive formats should be kept in the future, especially for allowing more time and spatial flexibility.

When it comes to evaluating “higher education institutions’ reactions” to the new situation, the most crucial point seems to be transparency or the lack of it. Communicating well seems to be very important in this situation of fast change. Students mentioned that many teachers did not have the necessary skills to offer quality online education in the beginning. However, many students appreciate teachers’ openness and engagement to trying new ways of digital teaching and of considering students’ feedback in this. A Slovenian Law student states that “through preparing various types of educational materials, they showed willingness to actually help and make studying in quarantine as useful as it could be” (NextNormal, episode 2, 18:10).

Students’ “self-study strategies” seem to be a crucial aspect in online studying at home. Many students interviewed mentioned that they were able to acquire those in previous semesters and that this was helpful in the recent situation. Contrasting studying with leisure activities is seen as important to one’s well-being by many students. Almost all students indicate that when studying at home, there is a bigger need to actively structure one’s day. A German Business student claims that “I try to make a weekly schedule [...] and I try to stick to it as closely as possible” (Studium im Shutdown, episode 14, 11:25, translated from German). Several students stress that they have learnt new things about themselves that might be useful to them. It can be deducted that studying has become an even more individual challenge with a high demand of self-organizational skills and other Future Skills that are crucial and could even be enhanced in this period, such as Learning

Competence, Self-competence, Self-efficacy, and Initiative & Performance Competence, those all being closely related to the individual development (Ehlers, 2020).

Several studies have found evidence that perceived “digital social presence” of instructors and peer students has implications for students' satisfaction with their learning experience (Richardson & Swan, 2003; Swan & Shih, 2005).

In the podcast interviews, social aspects and contacts are among the points seen as most critical by students when it comes to online studies: most students indicate that keeping in touch and being socially connected is something that is difficult to ensure when studying online, such as a Belgian student says: “We are connected every second of the day, but still we are lacking in this crisis the corridors to meet each other and we are really lacking the small talk” (NextNormal, episode 3a, 4:29). The fear and experience of social isolation is present in several students' answers. Possible solutions are seen in collaborative study designs and in digital meetups.

When it comes to “what could be improved”, several students ask for a better communication on the institutional side. For the future, many students ask to keep some of the aspects allowing more flexibility for students as well as to enhance digital teaching offers such as lecture recordings and to maintain a more positive attitude towards digital teaching. However, some students also ask for institutions to tackle challenges such as interdisciplinarity and sustainability and to remain open to change. A German Psychology student claims that “higher education institutions have proved that they are able to quickly adapt [...] and they will have to explain why they do not want something. I am looking forward to this debate” (Studium im Shutdown, episode 5, 26:00, translated from German). Some students express their expectations on institutions critically evaluating the recent study experiences and of also taking students' views into account. There is a certain wish for institutions collaborating and exchanging more closely with other students and a certain concern for studies not being inclusive enough and thus a demand for higher education to become more accessible to everyone. One of the central aspects mentioned, however, is for institutions to find ways of ensuring social interaction between students and their teachers as well as between students and their fellow students. There is also a wish of considering students' individual study situations which might have become precarious due to the loss of jobs etc.

In the online survey, a big amount of students indicated that they would like to keep certain digital teaching formats, especially lectures, for allowing more flexibility in a hybrid study model thanks to on-demand classes, with a possible mix of formats. However, it was expressed that face-to-face classes were still favourable by most students, especially in

regard to discussions and social exchange. Several students also wished for central, institution-wide technical and software solutions, this possibly being due to the specific institutional circumstances of the interviewed students. Another option is to offer smaller group sessions with teachers in order to allow more timid students to actively participate. Digital group work is also given preference to as well as different interactive formats.

To sum up, the following subjects are those that, from a students' point of view, require special attention in future concepts for higher education and according research: For a certain group of students, public study spaces are necessary in order to successfully pursue their studies, and the diversity of students' individual challenges must be respected. When planning courses, the workload for students needs to be considered. For the digital study experience, the adequate infrastructure is crucial in order to make it a valuable experience and to be accessible for all students. Interactive and synchronous formats and a high level of interaction with teachers and other students are important in order to allow a quality learning experience, but they do not completely solve the question of lacking digital social presence. Moreover, institutions need to find ways of promoting self-organizational skills, but also of communicating efficiently with students – and students will expect them to remain open to change.

## **Summary and Outlook**

From analysing the data collected by podcast interview recordings and an online survey, we can learn that the recent situation has highly challenged students on an individual level, fostering their self-learning and self-organizational skills when structuring their study routines, thus stressing the importance of Future Skills learning. When thinking about the future after the COVID-19 shutdown, many students wish for keeping some of the digital teaching formats, for example for lectures, in order to allow them more spatial and time flexibility. However, there is a consensus that face-to-face studies are important and the basis for deep exchange with teachers and students – this often taking place before and after the actual class. Social aspects seem to be a crucial point for explaining what does not really work right now and in the past months – this also including aspects such as isolation and the feeling of being disconnected. Deeper analysis especially on the aspect of social presence is highly needed and in progress, with those interviews as well as the survey not claiming for representativity. However, they are a strong signal towards including students' voices in the debate on higher education in times of COVID-19 and in the future in order to provide quality education accessible to everyone.

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## INTERNAL CONSISTENCY OF THE EDUCATIONAL VALUE SCALE FOR GREEN OUTDOOR SETTINGS – THE CASE OF EDUPARK APP

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### Abstract

The purpose of this paper is to analyse the internal consistency of an Educational Value Scale (EVS) to be used to assess individuals' subjective perception of an educational app ability to support relevant learning in green outdoor settings. In this work, the EVS is presented as a scale with 12 items and data is aggregated and analysed to contribute to an empirical validation of the educational value construct. In this study, the analysis focuses a scale desirable psychometric property, the reliability, which is analysed through a robust Cronbach's  $\alpha$  estimation. Data for analysis is collected from a total of 924 responses to a questionnaire from students (of all school levels) and their teachers, after using the EduPARK app during a one-year face-to-face survey. Results reveal that the scale has internal consistency for teachers and older students (2<sup>nd</sup>, 3<sup>rd</sup> Cycle of Basic Education and Secondary teaching students). This study is an initial effort to validate an EVS, which can be helpful to researchers developing and accessing educational apps and to educators selecting educational apps to integrate in their teaching practices.

**Keywords:** Educational value scale (EVS), mobile learning, educational app assessment, Robust Cronbach's alpha, internal consistency, reliability, EduPARK app, empirical study.

### Introduction

The ubiquity of mobile phones and its use for educational purposes has been a growing field of research with positive results in learning. Frequently, mobile learning literature reported student gains in cognitive and skill-based outcomes, as well as increased motivation and engagement (Zydney & Warner, 2016).

There is an increasing offer of educational mobile apps; however, their ability to promote learning is seldom demonstrated, and few trustworthy information on their quality is available. For example, the popularity criteria for app selection may not be the best option, as the same app can yield different educational gains in different educational contexts.



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Hence, for teachers and parents the task of deciding which educational app(s) to use with their students or children is not simple. Thus, they could highly benefit from the wide application of a scale to evaluate this type of software.

In academic and industry, the development of educational apps for mobile learning can benefit from the target audience's feedback, as users' perceptions, for example about the usability, acceptance and improvement, can contribute to refine software prototypes (Pombo, Marques, Afonso, Dias, & Madeira, 2019). The use of scales to evaluate apps' educational value is also relevant. Evaluation tools are frequently extensive and difficult to complete, as the evaluation framework developed by de Freitas & Olivier (2006), especially if younger students' feedback is included in the study. The same app can promote learning in a given age group or audience with certain characteristics, but not for another.

Internal consistency is associated with a desirable psychometric property, reliability, which is usually analysed through Cronbach's  $\alpha$  (Hair, Black, Babin, Anderson, & Tatham, 2010). The purpose of this study is to analyse the internal consistency of an Educational Value Scale (EVS) to be used to assess users' subjective perception of an educational app ability to support relevant learning in green outdoor settings. For app consumers, the contribution of this scale relies in supporting educational practitioners in designing instruction strategies and materials for learners, taking advantage of mobile devices affordance. Furthermore, EVS can be useful for researchers and educational software developers to assess their products and decide if further improvements are needed.

The paper is structured in the following sections: (a) Methods, with the description of the procedure of the EVS development and analysis of its internal consistency through the robust Cronbach's  $\alpha$ , considering data from 924 questionnaires filled in by students and their teachers after using the EduPARK app in a green outdoor setting; (b) Results and their discussion in the light of literature, implications for research and practice, research limitations and proposals of future research.

## **Methods**

This section describes how the EVS was created and its internal consistency analysed. First the EduPARK app is presented, as data was collected in reference to this particular mobile app. Follows a brief description on how the scale items, presented in Table 2, were produced. Finally, the procedure to analyse the internal consistency is also presented.

### ***The case of EduPARK app***

The EduPARK app was developed by the EduPARK Project (<http://edupark.web.ua.pt/?lang=en>) multidisciplinary team, involving researchers from the University of Aveiro (Portugal). The project aimed at creating attractive and effective strategies for interdisciplinary learning, relying on the development of an interactive mobile augmented reality app that supports geocaching activities a green outdoor setting – the Infante D. Pedro Park, in Aveiro. The City Council allowed the installation of plant identification plaques in the city park with augmented reality information in images, audios, videos, schemes, and 3D plant leaves.

The app can be used autonomously, and at any time, through the game mode or explore freely mode, promoting authentic learning so that visitors can enjoy a healthy walk while learning. The game includes several learning guides for different target groups: teachers and students from Basic to Higher Education, and also visitants and general public, in a lifelong learning perspective, as the tourist guide is also offered in English. The guides integrate multidisciplinary issues under the Portuguese National Education Curriculum and propose interdisciplinary questions articulated to educational challenges along the park. The goal is to accumulate points by answering correctly the questions, visualizing augmented reality markers that help to answer questions, and finding virtual caches in a logic of treasure hunt. Further information about the game and app can be found in Pombo and Marques (2019).

The EduPARK app development follows a design-based research methodology, with successive refinement cycles, based on the users' feedback. The project organised activities for students, teachers and visitors to gather a convenience sample to collect systematic data. The activities occurred in the Aveiro Park and comprise: (a) a small introduction on the activity and some instructions on how to use the EduPARK app to play; (b) the actual game playing with the EduPARK app by groups of (usually) three or four students accompanied by an adult (a teacher, other school staff or an EduPARK team member), and (c) the filling in of a paper questionnaire (with the EVS, as described in Pombo & Marques, 2019) and the leader-board construction and announcement to participants, with small prizes distribution. The average response time to que questionnaire was 10-15 minutes.

The data collection occurred from March 2018 to April 2019. Table 1 reveals that a total of 44 activities for 1007 students, from the 1<sup>st</sup> Cycle of Basic Education (CBE) to Secondary teaching, and 122 accompanying adults, were organised both in formal and non-formal educational contexts. Five activities (out of 44) were mixed in what concerns students' school level (both 1<sup>st</sup> and 2<sup>nd</sup>/3<sup>rd</sup> CBE).

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Table 1: Relation of number of activities, participant students, and accompanying teachers in the EduPARK activities, per school level

	1 <sup>st</sup> CBE	2 <sup>nd</sup> /3 <sup>rd</sup> CBE	Secondary Teaching	Total
Number of activities	23 (5 mixed)	21 (5 mixed)	3	42
Number of students	476	396	74	1007
Number of teachers	91	24	7	122

**Developing EVS**

The EVS was developed under the EduPARK project (as described in above), which aimed to analyse the impact of the EduPARK app on different dimensions: (a) learning value; (b) intrinsic motivation; (c) engagement; (d) authentic learning; (e) lifelong learning; and (f) conservation and sustainability habits. For that purpose, two educational researchers, with expertise in mobile learning in green outdoor settings, analysed literature associated with the assessment of the above-mentioned dimensions (Crick & Yu, 2008; Erdogan, Ok, & Marcinkowski, 2012; Martínez, Aracón, & Hita, 2014; Simões & Alarcão, 2011; Walker & Fraser, 2005) to propose a set of items for the EVS. The set of items was revised in several rounds to remove, add and/or adapt items so they could measure the intended construct: the educational value based on the six dimensions mentioned above.

The educational researchers had the experience of using, under the same project, the System Usability Scale (SUS). This scale was developed by Brooke (1996) to quickly and easily collect a user's subjective rating of a product's usability. According to Bangor et al. (2008), who aggregated and analysed data from 2,324 questionnaires collected over 10 years, SUS is a widely used instrument in usability studies, with a high reliability: 0.91. In a similar way, EduPARK educational researchers decided to attempt to develop a scale to quickly and easily collect users' subjective rating of the educational value of an app for outdoor green settings. Taking this into account, two items from each of the above-mentioned six dimensions of educational value should be included in the scale. In the iterative process of items generation and negotiation, 12 items earned both experts' agreement and were selected for inclusion in the EVS (see Table 2). Similarly to SUS, positive and negative items were alternated, to make sure the respondent reads and understands each statement before deciding whether or not to agree with it. The items were scaled in Likert format anchoring from 1 – *strongly disagree* to 5 – *strongly agree* for the analysis.

Table 2: Educational Value Scale (EVS) items

EVS item
1. This app helps you learn more about topics we study at school.
2. This app shows information in a confusing way.
3. I feel motivated to learn when I use this app.
4. I do not feel like using this app to learn.
5. Even in the difficult quiz-questions, I try to find the right answers.
6. Sometimes I respond randomly (without thinking).
7. This app shows real-world information that helps you learn.
8. I will quickly forget what I have learnt from this app.
9. Park visitors can learn from this app.
10. This app promotes learning only in a school context.
11. This app makes me feel like talking to others about nature protection.
12. This app does not help to realize that it is important to protect nature.

### **Internal consistency**

Internal consistency of the EVS was assessed as a measure of scale reliability. Cronbach's coefficient  $\alpha$  is one of the most widely adopted measure of the lower bound of the reliability (Hair et al., 2010). However, as this  $\alpha$  has received some criticism in the literature, Zhang and Yuan (2016) robust Cronbach's  $\alpha$  estimation procedure was followed to control the influence of outlying observations and leverage observations. In this procedure, three different plots are analysed to determine the adequate downweigh rate ( $\varphi$ ) to compute Cronbach's  $\alpha$  for a dataset.

Although the Cronbach's  $\alpha$  is usually computed for data collected on a particular occasion (Taber, 2018), data aggregation from multiple studies collected through standardized scales has also been conducted before (Bangor et al., 2008). Hence, a robust Cronbach's  $\alpha$  was estimated for all the 924 cases aggregated in one dataset and for four subpopulations within it, originated from 42 data collection events. An  $\alpha$  value which exceeds 0.7 can be considered acceptable (Hair et al., 2010). However, other authors consider the value 0.6 as the lower bound of reliability acceptance, particularly in early stage of research (Griethuijsen et al., 2015; Nunnally, 1967).

### **Results and discussion**

This section presents and discusses, in the light of literature, the internal consistency of EVS. Research limitations are discussed and future directions are proposed.

Table 3 presents the estimated Cronbach's  $\alpha$  for the entire dataset (924 cases) and for the four considered subpopulations within it. Complementary data, such as standard deviation (SD), confidence intervals (CI) and used downweigh rates ( $\varphi$ ) are also presented.

**Internal Consistency of the Educational Value Scale for Green Outdoor Settings – The Case of EduPARK App**Table 3: Estimated Cronbach's coefficient  $\alpha$  for the entire dataset and for four subpopulations within it.

	Total	1 <sup>st</sup> CBE	2 <sup>nd</sup> /3 <sup>rd</sup> CBE	Secondary Teaching	Accompanying Teachers
Robust $\alpha$	0.732	0.653	0.738	0.716	0.818
SD	0.018	0.035	0.030	0.056	0.040
CI	0.697 to 0.767	0.584 to 0.722	0.680 to 0.796	0.606 to 0.826	0.740 to 0.896
$\varphi$	0.00	0.00	0.07	0.10	0.10

Considering 0.7 as the  $\alpha$  value for an acceptable reliability (Hair et al., 2010), the  $\alpha$  for 2<sup>nd</sup>/3<sup>rd</sup> CBE (0.738), Secondary Teaching (0.716), Accompanying teachers (0.818) and total data set (0.732) can be considered from acceptable to good. This indicates that EVS has achieved an acceptable or good internal consistency. On the other hand,  $\alpha$  value for 1<sup>st</sup> CBE (0.653) falls just below the common acceptable threshold, accordingly to Hair and colleagues (2010), or this  $\alpha$  value is just within the lower bound of acceptance (Griethuijsen et al., 2015; Nunnally, 1967). This result might be explained by the age of respondents, as younger students (age range from 6 to 11) may lack the maturity level required to truly understand and answer correctly the scale items. For example, 43.7% of these students attended school year 2, so their reading skills were still in an initial phase of development, with notable difficulties in understanding the scale items. Furthermore, the alternation between the positive and negative wording of items can lead to misinterpretation and difficulty in reversing responses from negative to positive ones. Users can forget to reverse their score accidentally agreeing with a negative item when they meant to disagree. These possible explanations are consistent with some other studies (Kortum, Acemyan, & Oswald, 2020; Ribeiro, 2020). Based on this result it is highly recommended to revise EVS items and graphic presentation of Likert scale to turn it more suitable for this school level.

The higher  $\alpha$  value was achieved in the teachers' subpopulation, as they are adults from the educational context, frequently use to answer questionnaires, for example, in the mandatory continuous professional trainings.

As implications for research and practice, this study intends to initiate an effort of scale validation. The EVS can become a useful instrument to support researchers in developing and accessing educational app, as it can be used as a standardized educational value questionnaire. Standardized questionnaires allow the collection of systematic data supporting higher objectivity, replicability and quantification of results, among other advantages (Sauro & Lewis, 2012). Likewise, an EVS can support educators in the selection process of the educational apps suitable for their teaching practices, as if EVS becomes widely used, apps that achieve higher EVS scores with students of their education level are expected to be more suitable for their classes.

Research limitations are related to the fact that empirical analysis was made on the Portuguese version of the EVS. Although the items translation to English was made by experience researchers, the participation of bilingual translator and back-translation method would improve the English version of the EVS. Likewise, eventual cultural differences were not taken into consideration.

For future research, it is recommended to adapt and to empirically analyse the internal consistency of the EVS scale for 1<sup>st</sup> CBE students, turning it more suitable for this study level, in terms of language, graphic presentation and use of always positive worded items. Moreover, the scale relevance will increase as educational app developers use this tool as a standardized questionnaire for Educational value evaluation.

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## A VIRTUAL REALITY ETRUSCAN MUSEUM EXHIBITION – PRELIMINARY RESULTS OF THE PARTICIPANTS' EXPERIENCE

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### Abstract

The current global health emergency has posed the need to reflect upon how to guarantee high standard of quality in 100% virtual exhibition. In this case study, we present one of the possible solutions to design a VR museum exhibition for educational purposes. The Centre for Museum Studies designed “The E-Trouria App”, a VR exhibition which is aimed at providing participants with personalised learning path based on an Etruscan museum collection in Rome. The App was designed by combining different pedagogical methods such as Digital Storytelling and Reflective Questioning. The goals of the research were to understand visitors' evaluation of their experience. 20 postgraduate students (F = 17; M = 3; Average age = 36 years) in Museum Education took part in the pre-pilot experimentation. Participants expressed very positive evaluation on the visit and their features (narratives, soundtrack and multimodality). Participants were emotionally engaged during the visit and the most reported emotions were “pleasure” and “wondering”. Future research steps are illustrated.

**Keywords:** Virtual Reality; Museum Education; Assessment; Visitor experience

### Introduction

The Covid-19 pandemic, that has spread over the entire world since the beginning of 2020, despite purely health issues, has highlighted the role of digital technologies in the life of every single person inevitably (Ting et al., 2020). The cultural sector – museums, theatres, cultural centres – had to face the question of remote fruition both for economic reasons and mainly because of the role of Culture as an integral and fundamental part of people's lives; never as before, Culture had to convert and adapt its way to communicate and mediate information to a new reality (Shaker, 2020). Clearly, the digitization of museum collections and the design of cultural digital experiences are not something new. In fact, there are numerous cases in the literature that highlight the efforts that museums are making together with multidisciplinary development teams. Bringing the museum and its

contents closer to the audience (Grau, Coones, & Rühse, 2017), digital projects offer both solutions within the museum structure – interactive exhibition, AR / VR experience – and remote solutions such as digital catalogues or Virtual Museum (Barbieri, Bruno, & Muzzupappa, 2017).

The potential of Virtual Reality technologies is manifold. If in the early 2000s these could seem only futuristic experiences and prerogative only of large research centres, starting from 2016, the year of the consecration of VR to the general public (Cellan-Johns, 2016), the number of applications and contexts of use of this technology has increased exponentially. The result of this escalation is clearly the release on the market of low-cost devices for the use of VR, first of all the economic and eco-sustainable Cardboard ([https://arvr.google.com/intl/en\\_uk/cardboard/](https://arvr.google.com/intl/en_uk/cardboard/)), produced by Google. Because of that, a series of apps – also produced by Google – such as Expeditions (<https://edu.google.com/expeditions/>) created in order to use VR technologies to engage students in learning, offer numerous virtual tours of various museums around the world.

Virtual reality can therefore be used to design for example museum tours or make exhibitions interactive. Currently, in fact, we can divide museum VR products into two types: on-site itineraries-exhibitions, and remote digital experiences. The former, such as the VR Zone of the Leonardo da Vinci National Science and Technology Museum (<https://www.museoscienza.org/en/offer/vr-zone>) in collaboration with Sony Entertainment, offers specific educational paths on site starting from the contents of the museum collection. The latter, the digital experiences such as The Grand Museum VR ([https://store.playstation.com/it-it/product/EP3645-CUSA13682\\_00THEGRANDMUSEUMEU](https://store.playstation.com/it-it/product/EP3645-CUSA13682_00THEGRANDMUSEUMEU)) produced by Sony for the PlayStation platform, take the form of Virtual Museums (VM), in order to complete and implement the museum experience (Barbieri et al., 2017) by offering personalized experiences based on user preferences.

These experiences, being able to be accomplished and enjoyed regardless of place or time (Kersten, Tschirschwitz, & Deggim, 2017), offer a totally accessible and inclusive service; cultural services that – in a condition of restriction of movement such as those caused by the Covid-19 pandemic – have proved to be vital for the maintenance of museums around the world (Network of European Museum Organisations, 2020).

All these experiences teach us that imagining a simple transposition of the museum object from physical to digital environment, without designing any form of active involvement of the user is methodologically wrong and counterproductive (Vaz, Fernandes, & Veiga, 2018). Thus, innovative digital technologies require a reflection on which teaching and learning practices could be adopted and developed within museum contexts.

### ***Pedagogical methods in cultural heritage education***

During the last decades, different pedagogical approaches that combine technology and cultural heritage education have been developed, such as Digital Object Based Learning (Chatterjee & Hannan, 2015), Visual Thinking (Housen, 2002), and Digital Story-Telling (Rappaport & Liguori, 2019). All these approaches are characterised by an active involvement and participation of the museum visitor.

It is necessary, and it is possible, to bridge the gap between physical and virtual fruition, leveraging the elements of storytelling, involvement, interaction and experience, in order to develop fundamental skills in museum visitors, such as Critical Thinking (Poce & Re, 2019). Nevertheless, the previously elements do not find correspondence in the digitization of museum objects or that suffer from gaps in terms of user experience (Barbieri et al., 2017).

In fact, offering a digital catalogue of the items present in a given museum collection is not enough to ensure a higher or at least equal fruition respect of the physical one. To achieve a high degree of involvement and educational effectiveness, it is necessary to build digital storytelling and environments that place the user in an active condition with respect to the interaction with the cultural object. One possible strategy is to make a transposition from the video-gaming world to the museum and cultural heritage ones through the application of gamification principles (Tayara & Yilmaz, 2020). These principles – leveraging the conceptual aspects of the game – allow to generate involvement and interest in a given theme, through narratives, the use of achievements: rewards and immersed environments. At the same time, they stimulate the so-called skills of the 21<sup>st</sup> century: Critical Thinking, Creativity, Communication and Collaboration (Qian & Clark, 2016).

From all the previous suggestions, E-Trouria App was developed. As will be explained in the following paragraphs, the app intends to present itself as a Virtual Museum Exhibition with a strong educational and experiential impact, seeking – through a data-driven design process (King & Churchill, 2014) – to offer a customized product based on the features and training needs of the user, easy to use, accessible and inclusive.

### **The E-Trouria App**

The E-Trouria app – whose name refers to the virtual journey through an assonance between the terms Etruria and electronic tour – is a stand-alone VR application both for MacOS and WindowsOS environment. In this first experimental phase, the application allows the fruition of one of the six thematic-educational paths that were previously described: the Etruscan woman. From a technical point of view, the application has two fundamental characteristics: on the one hand the virtualization of the museum space and its artworks, on the other the interaction and movement within it.

As regards the first point, it was decided to make the virtual environment of the museum as abstract and neutral in terms of visual language. The motivation traces back its origin from the aim to create a counterweight environment with respect to the decorative richness of the objects it contains. Nevertheless – in conceptual terms – the sequential structure of the rooms has been maintained; a typical element of contemporary architecture to those of the Villa Giulia Museum. The route includes the exploration of the female figure in the Etruscan age, through the use of five iconic archaeological objects from the Etruscan Museum of Villa Giulia collection. Through Olpi and Bucchero, Jewels and the well-known Sarcophagus of the Spouses, ad hoc storytelling have been created – analysed in their history and contents, in terms of decorations and stories – which, starting from the work itself through knowledge of the contents and stimulation in terms of critical capacity (Poce & Re, 2017). In addition to a main narrative, a series of in-depth analyses have also been provided - at the user's discretion - in order to broaden the specific knowledge of some themes emerging from the central narrative of the artwork.

### ***Technical features of the E-trouria App***

The artworks contained within the application and the virtual environment were designed using the 3D modelling software Rhinoceros (<https://www.rhino3d.com/en/>), together with photo editing software Adobe Photoshop (<https://www.adobe.com>) for the definition of the covering textures of the decorations and objects. Subsequently – for the interaction part – the designed elements were incorporated with the intent of the Unity software (<https://www.unity.com>). The user can move within the virtual space through an interface – developed on Adobe XD (<https://www.adobe.com>) – designed to obtain the highest level of usability and readability.

For this reason, even the font used in the app – Biancoenero (<http://www.biancoeneroedizioni.it/font/>) – designed by graphic designer Umberto Mischi, with the advice of Alessandra Finzi (cognitive psychologist), Daniele Zanoni (expert in study methods in learning disabilities) and Luciano Perondi (designer and teacher of typography at the ISIA in Urbino), has the aim of allowing an agile reading even towards subjects with SLD disorders, without lacking to elegance and general usability. The font, in fact, compared to many others similar in purpose, is characterized by a great visual satisfaction even for those who do not suffer from these diseases, thus offering an inclusive and non-niche experience.

From the point of view of the virtual experience, the user – once the product installation phase is complete – starts the application and completes phase 1 of profiling (necessary for the subsequent data interpolation phase). A short tutorial on the movements is provided to simplify the experience. Subsequently, the virtual experience begins.

The user can move around the virtual space in total freedom. Inside each thematic room – made up of 6 display cases – the main object of the narration is placed. To facilitate the interaction with the object, and start the narration, a user experience trick has been chosen, i.e. the use of an indicator / coin that the user will have to collect (by clicking on it), which will start the narration of the specific artwork. After the reading phase of the narration and of the related comprehension questions, the user will be rewarded with the relative coin. Once the path is completed and all the coins have been obtained, the user will be able to access the last room of the experience. Finally, an outgoing questionnaire allows you to collect data on the experience and be able to understand, as we will see in the following paragraphs, the relationship between use and personalization choices.

### **Research questions, data collection and data analysis**

Before testing the application with a large group, we decided to carry out a pre-pilot activity with a group of 20 postgraduate students (F = 17; M = 3; Average age = 36 years) in Museum Education from Roma Tre University. Working with this group allowed us to achieve two purposes: firstly, we collected data from experts in the field of cultural heritage and museum education; secondly, we provided those students concrete applications of the contents presented during the post-graduate course. The pre-pilot activity was aimed at answering the following research question:

#### **How do visitors evaluate the experience in the VR exhibition?**

The E-Trouria app was equipped with two kinds of questionnaires designed to collect information on visitors' profiles. The first questionnaire was designed to be filled by the participants before the visit and the second one after the visit. In the first questionnaire, items were built starting from a tool developed for a similar purpose in a museum context, the Acropolis Museum in Athens (Antoniou et al., 2016). The two questionnaires together were thought to retrieve information on the following dimensions: (a) personal data, such as gender, nationality and prior visits, (b) general artistic preferences, (c) favourite activities and mood in museums, (d) extraversion/introversion dimensions, (e) preferences for the museum objects and their related contents, (f) preferences for the fruition modality such as 100% virtual, 100% physical or blended. The questionnaire includes both closed questions and short open-ended questions. Further data were collected regarding (g) participants' engagement (h) and critical thinking with intermediate questions related to each object's narrative during the visit. We calculated descriptive statistics to understand how participants assessed the experience in the VR museum.

## Results

Results show that participants had some kind of familiarity with the contents of the virtual exhibition. Indeed, the majority of participants had already visited an Etruscan museum ( $N = 17$ ), although most of them never visited a virtual museum before the experimentation ( $N = 13$ ). Almost all the participants would suggest to other people the E-trouria App experience ( $N = 18$ ).

Participants expressed positive evaluation regarding the main E-Trouria app features (Figure 1). 19 students appreciated *a lot* or *totally* the virtual exhibition in general. Narratives were appreciated *a lot* by 14 students and *totally* by the remaining six students. Multimodality was appreciated *a lot* or *totally* by 17 participants while the remaining 3 students did not express any opinion on that. Regarding the Soundtrack the students' opinion was less uniform. Although most of them ( $N = 12$ ) appreciate the Soundtrack *a lot* or *totally*, 4 participants did not appreciate the music much. Having said that, when participants were asked to express a preference among different fruition modalities, none of them expressed a preference for 100% virtual visit. 18 participants would prefer a mixed reality solution and 2 participants would prefer the traditional physical visit.

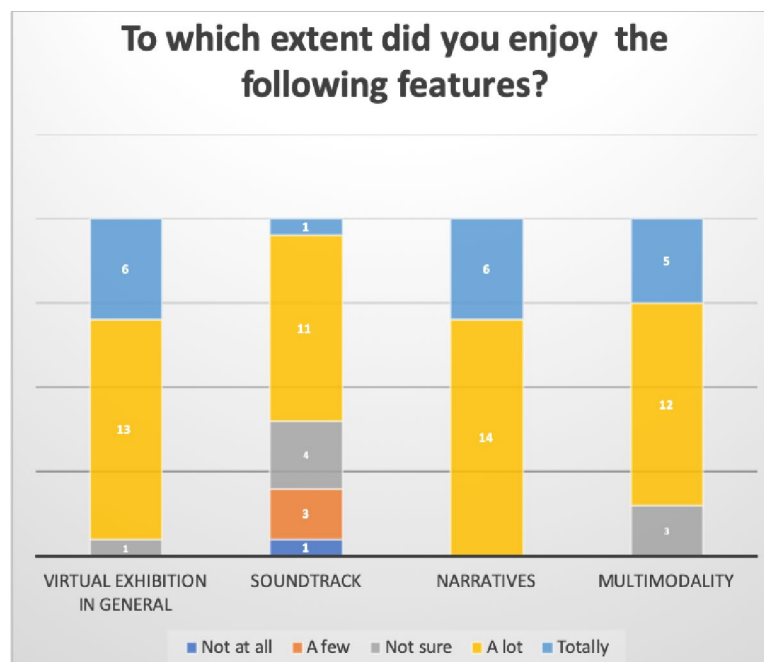


Figure 1. Participants evaluation of the main E-Trouria app features

In Figure 2 we can see the association between the different archaeological objects and emotions expressed by participants. We can see that each archaeological object engages participants in some way. The most reported emotions are *wondering* and *pleasure*. The Sarcophagus is the object most associated with the *pleasure* emotion ( $N = 16$ ) whilst the Bucchero Olpe is the most associated with the *wondering* emotion ( $N = 12$ ).

The Sarcophagus of the Spouses was considered the favourite object by 10 participants. The story related to the Bucchero Olpe was the favourite one for 8 participants, although the “Olpe” was the favourite object only for two participants. The association between the favourite narrative and the favourite object is low. The Bucchero Olpe, for example, is considered only by two participants the favourite object, but it was the most popular narrative among participants.

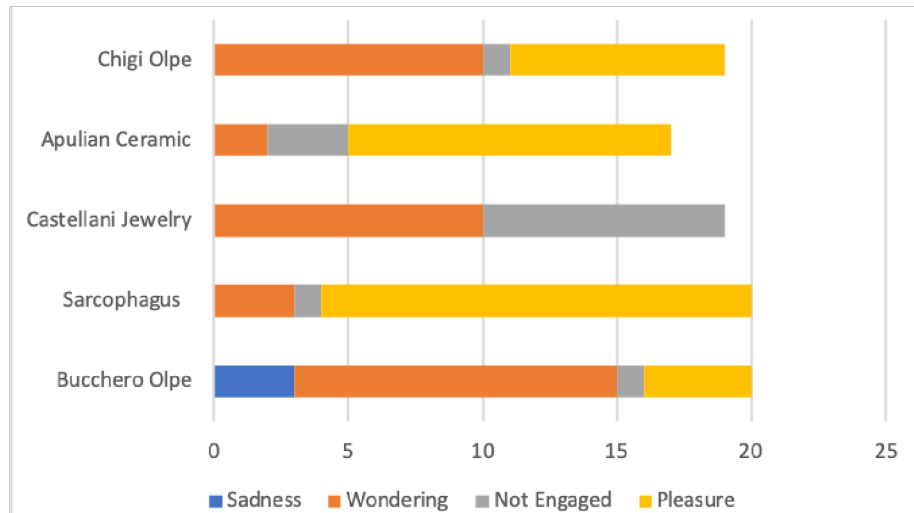


Figure 2. Emotions expressed in relation to the 5 archaeological objects' contents

## Conclusion and final remarks

The current global health emergency has posed critical challenges for the cultural and the museum sectors. Trends related to the use of digital technologies, such as VR and AR, have started to become popular in the museum field even before the beginning of the health emergency. In the last months, we saw that some museums were more prepared than others to face the challenges of digitalization and to provide visitors' alternative opportunities to access their collections. In this case study, we present one of the possible solutions to design a VR museum collection for pedagogical purposes, by maintaining the focus on the promotion of inclusiveness, personalization and visitors' critical reflection. A learning path was designed by combining the Digital Storytelling with Reflective Questions methodologies, devoted to the solicitation of visitors' critical thinking. Participants reported to be emotionally engaged during the visit. The most reported emotions were *wondering* and *pleasure*. Both these emotions were correlated with the choice for the participants' favourite narratives. Regarding the soundtrack, we found that participants did not express a homogenous opinion on that feature. This contrasting opinion could be possible mediated by personal visitors' features, such as extraversion/introversion level. These results are preliminary in nature, but they provide initial methodological and pedagogical insights regarding the design of VR museum exhibition for educational purposes. Compared to the current state of progress, the project clearly has margins for

implementation. After this first experimental phase, the collected data will be used to improve the general UX of the product in terms of use / movements, general readability and educational contents. A greater degree of customization can be offered during the start-up phase on the app (type of reading use – light or dark mode – choice of soundtrack or voice controls) while – through the necessary changes – it will be possible to convert the app firstly into a stand-alone product available online without the need for installation, and subsequently make the transition from a VR use to AR one, thus being able to offer an on-site product for the museum and its users. We tested the application with a target of cultural heritage experts and we do not know which kind of response we would have received from other kinds of targets. For this reason, in the near future we are going to test the application also with high-school students from disadvantaged cultural contexts.

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## USABILITY EVALUATION OF THE MOBILE APPLICATION FOR THE VIRTUAL MOBILITY LEARNING HUB

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### Abstract

The use of MOOCs (Massive Online Open Courses) has become very popular in the past few years. Such courses can teach a large variety of skills, including the basics of virtual mobilities, both for students and teachers. The Open VMLH (Virtual Mobility Learning Hub) is an innovative multilingual environment which was created as part of the Erasmus+ Open Virtual Mobility project, with the purpose to promote collaborative learning, social connectivism and networking as an instructional method, OERs as the main content, and open digital credentials. In this paper, we will present the usability evaluation of the Open VMLH mobile application, a mix of heuristic and cognitive evaluation methods. Some of the issues discovered are related to the general interface and functionality of the mobile application, while others are related to the structure of the courses and the implementation of the content, but just a couple of them are critical for the user experience.

**Keywords:** Usability Evaluation; Human Computer Interaction; User Experience; User Testing; Remote Testing; Focus Group; User Observation; Expert Reviews; Learning Management System, Massive Open Online Course; Virtual Mobility.

### Introduction

In the last years, the use of Massive Open Online Courses (MOOCs) has become a very popular way to deepen one's knowledge in a variety of fields. According to (Lee et al., 2018), a MOOC is practically an online learning platform with a large number of students. Going in the details of the term, a MOOC is addressed to a massive number of people, it is open to anyone, it is hosted online, and it offers educational resources that are accessible to anyone.

According to (Johansson & Frolov, 2014), an even more extended definition of a MOOC includes the following aspects: an online course that doesn't need physical presence; an

available and accessible course for everyone, from anywhere; the course is self-directed, self-paced or time limited, having a start and an end date; it consists of video lectures and/or readings, examinations in the form of assignments, exams, experiments; it supports interactivity between the participants and the tutors through online forums or other social media platforms; its content meets high academic standards; and it supports the creation of educational communities.

An example of MOOC platform is the Open VMLH (Virtual Mobility Learning Hub), an innovative multilingual environment which was created as part of the Open Virtual Mobility, a European-funded project, with the purpose to promote collaborative learning, social connectivism and networking as an instructional method, OERs (Open Educational Resources) as the main content and open digital credentials (Andone et al., 2020). The Virtual Mobility Learning Hub is available both on website and through a mobile application.

Following our research in (Andone et al., 2020), where the authors of this paper presented the usability evaluation for Open VMLH website, here we will present the usability evaluation of the Open VMLH mobile application.

The usability evaluation was organized entirely remotely, due to COVID-19 restrictions, by the authors and a group of students in the Multimedia Technologies master's degree program at the Politehnica University of Timișoara (Romania).

Usability is defined as a qualitative assessment of the user interface in a product, such as a website or a mobile application, in addition to its purpose that allows users to achieve specific goals (Johansson & Frolov, 2014).

In this context, small screen size, limited interaction model, limited processing and storage space are aspects that make the mobile usability an important factor in mobile application development (Azzahra et al., 2015). However, users prefer mobile apps that are easy to learn, take less time when completing a task and, mobile apps with a dynamic interface (Nayebi et al., 2012).

## **Related work**

Researchers from the e-Learning team of the Faculty of Computer Science, University of Indonesia, present in (Banimahendra & Santoso, 2018) the implementation and the evaluation of a LMS mobile application named SCeLE (Student Centred e-Learning Environment). The usability evaluation of SCeLE involved the user observation session with 14 participants and the questionnaire method using the SUS questionnaire, with 107 respondents. Although the final results were good, the authors came up with the conclusion that some parts of the application must be improved, such as the login process,

the order of some parts of the content, the search features of the forum or the notification features.

The authors in (Pensabe-Rodriguez et al., 2020) describe the evaluation of a Context-Aware Mobile Learning System (CAMLs) with six professors and forty-eight high school students. The evaluation, which was done as a field study in a real environment, showed 82.4% acceptance rate by both professors and high school students.

A systematic literature review was performed by the authors of (Kumar & Mohite, 2018) in the field of usability testing of mobile learning applications. The authors provide a valuable insight into the methods, the gaps and the future research directions in the field.

### **Usability evaluation of the open VMLH mobile app**

The VMLH mobile app, based on the Moodle open source app, is available for both Android (<https://play.google.com/store/apps/details?id=eu.openvirtualmobility.hub>) and iOS (<https://apps.apple.com/app/id1481003592>). The app features 8 mini MOOCs, each composed of 3 courses for Foundation Level, Intermediate Level and Advanced Level. The courses which were part of the app and evaluated are Media and Digital Literacy, Intercultural skills, Autonomy-driven Learning, Active Self-regulated Learning, Collaborative Learning, Networked Learning, Open mindedness, and Open Education and Virtual Mobility. Figure 1 shows the homepage of the MOOCs in the app.

### **Methodology**

The evaluation of the OpenVM mobile application consisted in applying a mix of testing methods to identify usability issues in the app (and suggest recommendations to fix them).

The usability evaluation was designed around two main research questions:

- Q1: What are the experiences that real students and teachers might have as learners in the VMLH mobile app?
- Q2: Is the VMLH app error-free and ready to become available to the final users?

The entire usability testing process took place in May 2020, with the evaluation being realized by a team of 3 students, coordinated by the authors of this paper, as a group project for the Usability and Interactivity course which is taught in the Multimedia Technologies master's degree program at the Politehnica University of Timișoara (Romania).

The authors chose 3 evaluation methods to maximize the qualitative data which was to be gathered. These are the user observation method, the focus group, and the expert review method.

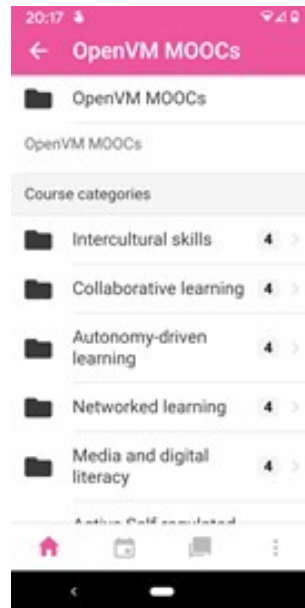


Figure 1. The home screen of the OpenVM mini MOOCs

In total, 12 participants took place in the evaluation: 9 university students and professors (as per the personas identified initially) and 3 mobile application experts.

Due to COVID-19 restrictions, the evaluation had to be realized completely remotely, using Microsoft Teams.

Each of the evaluation methods is described in the following subsections.

#### *The User Observation Sessions*

Because the mobile application is intended to be used both by students and professors, for the user observation method, the group of participants was composed by 3 students and 1 university professor.

Before the session, they had to fill in a prequestionnaire to give the authors a better view regarding their skills in using mobile applications and MOOCs. One of the participants had experienced a virtual mobility before.

The tasks they had to complete were designed to evaluate both the interface of the mobile application and the implementation of the MOOCs in the app.

Most of the tasks were completed with few errors during the process, however, the participants encountered some issues that affect the entire experience of using the application. The issues were related to the login process, the implementation of the multimedia elements (some of the videos did not work properly), the navigation buttons (some of them were not suggestive) and the content (which was not fully translated in all the app's official languages).

At the end of the session, each participant had to complete a postquestionnaire to give more information about their overall experience within the application. In general, the participants said that their experience was pleasant, besides the small issues that they have encountered. They would use it again because it can help them become more productive.

#### *The Focus Group Session*

Five participants, university professors and students, were engaged in a focus group to give feedback about the OpenVM mobile application. As the others, the session was organized remotely, through Microsoft Teams.

Before the session started, all the participants completed the prequestionnaire to help the authors to create a more complex profile of the users.

At the first glance, they considered that the design of the application is appropriate, and they enjoyed the experience.

Walking through the mobile application they discovered that the video tutorial is not integrated properly and that on the main page they could not find any information regarding the purpose of the application. They also considered that the support sections need to be improved – this it would really help create a better experience for the future users.

The navigation was considered quite easy and intuitive, with few exceptions related to some parts of the menu. Also, they considered that the log out section is not intuitive at all and they struggled to find it.

Another thing that the participants appreciated was the integration of the interactive calendar functionality, but they stated that they were a bit confused because they did not figure out exactly what kind of events could be programmed using the calendar.

They were also a bit confused by the fact that the application contains 2 different sections where they could visualize their grades.

They graded the app as 7.5/10 and they also stated that they would recommend it to a friend.

#### *The Expert Review Sessions*

For this evaluation method, 3 mobile applications specialists were asked to walkthrough the mobile application and give feedback and recommendations to the usability engineers (Figure 2).

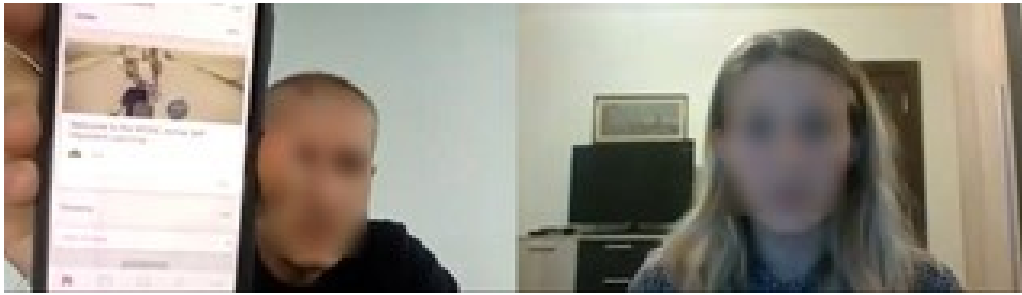


Figure 2. Screenshot from the one of the expert review sessions

This method was used because it can highlight many important issues in a short period of time and because, considering the experts' point of view, the issues discovered can be prioritized easily.

Some of their observations were related to the defective login process, the lack of the progress bar when downloading courses for offline usage, the missing support information regarding the use of the application, the grading process, and the matching between tags. Also, they noticed that the video tutorial does not have a preview image, so the users believe that it does not work.

Another issue was that some buttons, for example the refresh button, are not suggestive. The fact that the tutors' contact details are not displayed in each course was considered a usability issue.

## **Results and recommendations**

After the authors analysed all the feedback obtained through the 3 evaluation methods, they made a classification of the issues identified.

Jakob Nielsen proposed a four-step scale to rate the severity of usability problems, as it follows (Nielsen, 2006): 0 – *The problem is not a usability issue*, 1 – *Cosmetic problem only*, 2 – *Minor usability problem*, 3 – *Major usability problem*, 4 – *Usability catastrophe*.

In the following part, the authors list the most frequent problems that have been reported, together with their severity rating (in parentheses).

Issues related to the mobile app's interface and general functionality:

- The login/sign up process is defective because even if the users can use multiple ways to sign up, only the Google login works properly (3).
- Some buttons' icons are not intuitive (e.g. log out button) (3).
- Integration of multimedia elements is defective (3).
- Search field is confusing (2).
- Help section lacks useful information (3).



### **Usability Evaluation of the Mobile Application for the Virtual Mobility Learning Hub**

- The “after sign-up” form is not easily visible, so the participants did not complete it (3).
- “Forum” section redirects the user to the site announcements section (2).
- Feedback sections redirects the user to the sign-up form (3).

Issues related to the courses’ structure and the implementation of the content in the mobile platform:

- Unavailable courses were not highlighted in any way, a fact that confused the users when browsing the courses (2).
- Some course sections were empty (2).
- Enrolment process is taking too long (2).
- “Download course” function is not well explained, and it created confusion among the participants (1).
- Not all the courses have a suggestive general description (2).

A list of recommendations was obtained from the participants after the sessions:

- The main page should contain more helpful information about the application and the courses.
- The participants would prefer the possibility to adapt the colours of the applications using the day-night view.
- The calendar section needs to be improved and to have support information attached.
- The videos’ integration needs to be improved.
- The colours should be updated to point out the importance of different key sections and functions.

## **Conclusions**

Nowadays Higher Education is transforming, as today most of the students are also working adults. Considering this aspect, online learning platforms, including the mobile learning environments, are flourishing.

These difficult pandemic times empower the idea that mobilities like Erasmus+ should be also available online. In this respect, mobile applications such as the “Open Virtual Mobility Learning Hub” mobile app are an important and even mandatory resources for both professors and students.

The evaluation of the OpenVM mobile application was organized remotely and a mix of both heuristic and cognitive methods were used to obtain the best qualitative results. The methods used were the user observation method, the focus group, and the expert review method.

The usability evaluation allowed us to answer the two main research questions as follows:

- A1: According to the participants, the overall experience was a good one and they really appreciated the opportunity to join a virtual mobility online, without having to go to another country. However, some specific usability problems related to the mobile app's interface and general functionality can seriously hinder their learning process.
- A2: The VMLH mobile app is not error-free and improvements need to be done before being made available to the final users. Most of the issues are in the areas of support information, navigation buttons and courses' content.

As a side note, this usability evaluation also contributes as a valuable example to the body of knowledge of implementing real-life cases of lab work with students.

As future work, we plan to solve the issues discovered and to add more functionalities to the mobile application, and to organize another usability evaluation to test the improvements.

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## **TOWARDS A POST COVID-19 DIGITAL AUTHENTIC ASSESSMENT PRACTICE: WHEN RADICAL CHANGES ENHANCE THE STUDENT EXPERIENCE**

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### **Abstract**

In 2020, the Higher Education sector, in the UK and internationally, had to move to online assessment because of the Covid-19 pandemic, at a speed and scale which might have been unimaginable under normal circumstances. By upscaling and accelerating the adoption of digital assessment practices in distance and online education across the world, educators had to rethink assessment processes to make sure they were an integral part of the authentic digital life experience for students and staff.

As these changes appear to be far from temporary, they have accelerated the transition to a “new normal” regime of assessing students online for the foreseeable future. The priority in the sector is that fundamental principles of assessment including integrity and authenticity are supported in the design and implementation of assessments. In addition ensuring that no student is disadvantaged in accessing digital learning opportunities, when they are assessed.

The paper discusses a project that collected data about three final assessment routes students have taken. The aim was to generate understanding of this transition to online assessment, primarily from the perspective of the experience of the students who have been affected.

Our findings explore student agreement with this transition to online assessment and provide an opportunity to understand student approaches to assessment and what they would like to see in future assessments. Finally we explore the implications for practice in distance learning and campus based environments and for the sector.

**Keywords:** Online assessment, e-assessment, transition to online learning, online exams, student experience.

## **Introduction**

After the onset of the coronavirus, universities all over the world had to move their operations to online spaces. This has also affected assessment practices, particularly when the locus was on campus or at teaching centres. The University of London Worldwide students had to move to online assessment in place of conventional examinations in exam halls during the Covid-19 pandemic, which precluded such events. Approx. 110,000 exams events were impacted by closure of exam centres around the world.

Such an abrupt transition to online assessment, posed instantly important questions about the quality of the student experience (equivalent to, or “as good as” the previous set-up) of the transition. Covid-related transitions had a catalytic effect on assessment philosophies and strategies and discussions about the right timing of transitioning. They also posed three related questions: (a) What measures would institutions need to put in place to ensure that the student experience of assessment was positive and unaffected by technology, format, or location, until institutions went back to normal? (b) What was the impact of transitions on pedagogy of assessing student performance? and (c) Was it the right time (taking evaluations into account) to move to online assessment practices for the longer term?

The paper focuses on a project that collected data about such a transition, whose aim was to generate understanding of the transition to online assessment, primarily from the perspective of the experience of the students who were affected.

## **Assessment theories and online assessment in practice**

Recent debates on assessment in the higher education sector revolve around changes and uncertainty for the future, mainly investigating whether 2020 has marked the beginning of the end for in-person, fixed-time, paper-based assessment (JISC, 2020a; Emerge Education & JISC 2020). In addition, universities see a need for balance between mitigating student stress and meeting the demands for academic rigour, both to satisfy student demands and achieve the recognition of professional, statutory and regulatory bodies that is critical to the career paths of many students (JISC, 2020b).

Recent research has also explored the relationship between students’ performance and preferences when using online and offline assessments and how to improve digital assessment practice and student motivation and engagement (Abrar & Mumtaz, 2017; Chase et al, 2017). Attitudes to assessment in open and distance learning environments have also been explored (Hatzipanagos 2009), since experience of appropriate assessment, good teaching, clear goals and standards, good materials and good tutoring are all

positively associated with increased attainment for distance learning students (Ertl et al., 2008).

In addition, the shift to online assignment and employing online invigilation and/or proctoring systems has generated debates on academic integrity. The issue of academic integrity comes up frequently in discussion (Farrell, 2020), highlighting good practice that involves creative design of authentic assessment, moderation of marking, text matching software, clear guidelines to students about expectations around referencing and the use of mechanisms e.g. vivas to verify student academic work.

## **Context**

University of London worldwide students are distributed across over 180 countries, studying with the university at a distance, but generally attending local Examination centres when taking paper based, fixed time examinations. Following a significant and rapid response to the impact of Covid-19 on the University of London Worldwide students' ability to participate in scheduled exams at a local Examination centre during the summer of 2020, the University provided over 100,000 exam opportunities online to approx. 35,000 students. Amrane-Cooper (2020) has described the background to this large scale transformation to assessment at the University of London.

The university made changes in assessment methods/formats due to the pandemic. The paper discusses a project that collected data about three final assessment routes students have taken: (a) Online, open-book exams with a paper to be downloaded and returned within a prescribed time, (b) Online exams via a Virtual Learning Environment (VLE), and (c) Digitally proctored exams. The aim was to generate understanding of this transition to online assessment, primarily from the perspective of the experience of the students who have been affected.

After explaining the background to this large scale transformation to assessment at the University of London, in the following section, we explore how we are evaluating and assessing the experience for students, staff and the institutional systems.

## **Methodology**

### ***Aims and objectives***

This project aimed to collect data about and generate understanding of this transition to online assessment, primarily from the perspective of the experience of the students who have been affected. The project aimed to answer a fundamental question: What was the impact of the transition to online assessment on the experience of students and student outcomes?

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The objectives and associated target deliverables of the project were to:

- Evaluate the number of students who deferred or withdrew from examinations rather than engage with online modes of assessment;
- Assess the impact (if any) on grades and outcomes in the academic year 2019/2020, in comparison to student outcomes in 2017/2018 and 2018/2019;
- Investigate the rationale for establishing new forms of assessment and why these particular forms have been chosen by selecting 10 Academic Programmes and examining views of Programme Directors (PDs) on the original choices made and exploring PD perspectives on the quality of what was achieved;
- Explore the key factors that influenced choices at the University by interviewing three key UoLW colleagues;
- Analyse the views of responders, gathered by an online survey;
- Explore issues arising from survey results by interviewing 30-40 students;
- Gather further information if available through other media and institutional data, such as the Student Learning.

### ***Areas under investigation***

We are looking at four key areas (Figure 1):

- Student Behaviours;
- Student sentiment;
- Student outcomes;
- Operational issues.

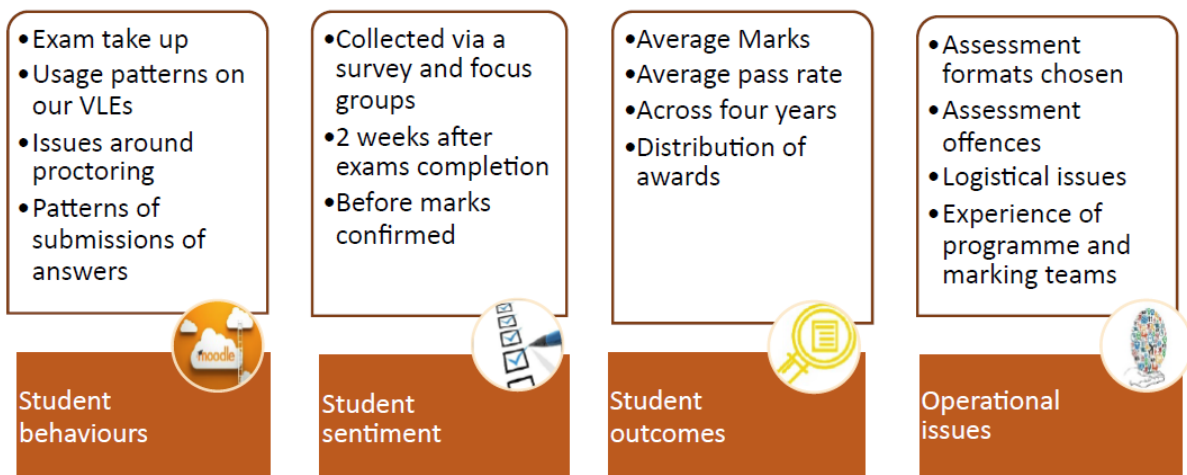


Figure 1. VLE usage patterns during exam period

The following section describes our preliminary findings.

## **Transitioning examinations online: findings**

### ***Uptake***

With exams completed, and while we are still processing the final data it appears that approximately 93% percent of our students were able to participate in online assessment. On average this is a higher percentage of exam engagement than in our traditional model of unseen exams taken at the University's 600 Examinations centres across the Globe. It appears that students felt they were given the opportunity to demonstrate their learning despite the pandemic. The assessments were selected from undergraduate and postgraduate academic subjects across a range of disciplines where online examinations took place. Findings reveal that students felt that there were benefits in moving to online assessment.

### ***Academic integrity and online assessment***

The data were examined and analysed, including parameters such as the location of the student (students are located geographically in over 20 time-zones). This would help to understand if local network and bandwidth availability or lack of had a significant impact on access and outcomes. The intention was also to examine differences in the format of examinations – we used three overall types of online examination: proctored exams, fixed time unseen closed book style exams and unseen but open book exams with a longer response time (24 hours or several days). Gender, age, programme of study and declared special needs that would require special examination arrangements are further parameters we have been exploring to ensure that no student is disadvantaged because of the move to online assessment,.

Student behaviour data are easily accessible via the institution's virtual learning environments (VLE) and in addition to a string uptake of online exams, we have also identified some initial findings. For example, with open book type exams, students still predominately accessed their exam paper as soon as their zonal exam became live for their location (the university operates zonal exam papers for our larger programmes to accommodate the need for security of the exam papers across global time zones). Some of the students appeared to submit within a few hours of receiving the paper, not taking the opportunity of a longer time-frame to evaluate the quality of their answers and reflect on their work. This has implications for how we help students prepare for future assessment, e.g. supporting them to develop strategies for a format that includes open book type assessment.

As the examiners completed their marking online, rather than marking paper exam scripts couriered to them, we also had the opportunity to explore the experience of academic staff



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in this “new normal”. Exam boards have been meeting to confirm marks and awards. This will give us the opportunity to embark on a detailed analysis of student outcomes, comparing average marks and pass rates with previous years’ performances. Examination formats may be an important factor to consider in the analysis of outcomes for students. Gender might be an important factor, if child care demands and work in the house under lockdown is disproportionately impacting on women students.

### ***Student voice***

Early response to the student experience survey has been strong, with a completion rate of 30% and over 8500 surveys to review. At this stage we are seeing students acknowledging and embracing the need to move to online assessment this year, and a strong correlation between VLE data in the survey responses give 93% completing online assessment. There were also responses from students who did not complete all or some of their online exams, and this reveals that for this early sample, their lack of engagement with the assessment is generally Covid-19 related rather than having to do with issues of access to WiFi or suitable computer equipment. It appears that Illness, disruption and mental health issues resulting from the pandemic has meant these students were not able to engage with the assessment.

Feedback from the survey has helped to illustrate how communication with students worked best, how they undertook their assessment – by writing or by typing, and if they encountered issues uploading their answers to the VLE. These are all areas that map against the operational and logistical lessons learned that are being reviewing. And which will be essential for us in exploring our future assessment modes.

### ***Preference for the future***

In the final part of the student experience survey, we looked at the future and asked students if they would like online assessment practices to continue. Data collected so far indicate a strong agreement with this, with only 12% of respondents disagreeing. When presented with a range of possible future approaches to assessment including online assessment taken (a) at home or in an exam centre, or (b) paper based exams in an examination centre, there is an opportunity to understand which approach they would like to see in future assessment during their studies.

### **Conclusions and further work**

The project collected data about three final assessment routes students have taken. The aim was to generate understanding of this transition to online assessment, from the perspective of the experience of the students who have been affected.

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The project data indicate that the transition to online assessment has facilitated changes in approaches to assessment, including the increased use of online exams. The adoption also touched on designing authentic assessments that use digital tools and require digital information literacies that are relevant to the professional lives of students.

We expect to have completed this large study by the end of October 2020 and look forward to sharing our findings with the sector as well as using it to inform our developments in assessment over the coming year. Moving 100,000 examinations online has implications for assessment practice and how much it improves student motivation and engagement, authenticity and validity considerations are obeyed in assessment design, how practice is set up to address the needs of students in distance learning and campus based environments and how the higher education sector keeps abreast of societal developments.

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## THE ECCOE APPROACH TO QUALITY REVIEWING ONLINE DESCRIPTIONS OF LEARNING OPPORTUNITIES

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### Abstract

As learners seek more flexible learning opportunities, and employers become gradually more open to accepting alternative forms of credentials, there is a need to improve the visibility and quality of the online information available about such opportunities. This information includes not only the descriptions of formal and non-formal learning opportunities, from full degree programmes to optional courses and MOOCs, but also the credentials learning opportunities can lead to and by whom these credentials are recognised. The new Europass initiative of the European Union is a major step forward in this respect, offering the possibility to search for both learning and employment opportunities via a platform that will support a variety of different credentials. Building on the Europass Learning Model, the Erasmus+ ECCOE project makes a significant contribution to this future platform, by defining specific quality criteria for evaluating both learning opportunities and their credentials.

This paper describes the methodology applied for the quality review of online descriptions with the ultimate aim of developing a catalogue showcasing learning opportunities that meet the criteria defined by the project. This methodology concerns two levels: (a) the actual process designed and implemented transnationally for the first iteration of over 100 learning opportunity descriptions, and (b) the two PDCA (Plan, Do, Check, Act) quality improvement cycles applied to refining the process itself. The paper also presents the results of this first iteration and formulates recommendations relevant for learning opportunity providers. Future work involving stakeholder consultation is also presented, as are the synergistic interactions between this

## The ECCOE Approach to Quality Reviewing Online Descriptions of Learning Opportunities

research and the overall ECCOE project outcomes within the wider context of European work on Digital Credentials and open, online and flexible learning.

**Keywords:** Digital credentials, Micro-credentials, Learning Opportunities, Europass, Quality Review

## Introduction

The move towards more flexible models of higher education provision is a growing trend, even if for many higher education institutions (HEIs) this is still in its early stages (Orr et al., 2018). For learners, this translates into a need to access such flexible opportunities as part of a wider approach to Lifelong Learning (Jaldemark, 2020). A reliable system of digital credentials can address this need by helping to bridge non-formal and formal education, such as recognising MOOC certificates within universities. The European Commission is working on the European Digital Credentials Infrastructure which will support the authentication of such digital credentials (European Union, 2018) within the framework of the new Europass, which includes a database of learning opportunities.

The ECCOE project aims to facilitate the endorsement and appropriation of open, online and flexible higher education, and to increase trust in technology-enabled credentials among students, HEIs and employers. To contribute to these goals, the project has conducted a wide-reaching review of Learning Opportunities (LOpps) which lead to digital credentials. The term *Learning Opportunities* is abbreviated here as LOpps to avoid any confusion with the commonly used acronym LO for *Learning Outcomes*. Learners and citizens in general need easy access to clear and precise information about such LOpps, including course content, learning modality, assessment methods and the type and level of credential which they can obtain. This quality review of LOpp descriptions is part of the overall ECCOE project activity around building recognition and trust in digital credentials. Related work conducted within the project involves a parallel study of quality criteria for digital credentials themselves, as well as the creation of a Model Credit Recognition Agreement (Read & Arnold, 2020) to facilitate inter-institutional recognition. Finally, in support of wider European work on the Europass Learning Model (GitHub, 2020), the development of an overarching ECCOE-system will bring these different elements together to meet the needs of all stakeholders concerned, including learners, HEIs and employers.

ECCOE has thus set up a quality review methodology and associated tools for evaluating LOpp descriptions, 109 of which have been processed through transnational collaboration during the first iteration of the quality review presented here. This paper explains the methodology and tools used, then provides a summary of the results obtained through this first review, followed by the implications of these results and the outlining of further work

## **The ECCOE Approach to Quality Reviewing Online Descriptions of Learning Opportunities**

to be undertaken in order to create a showcase Online Catalogue of Learning Opportunities (OCLO).

### **Methodology**

The overall process consisted of three main phases:

1. Defining relevant LOpp descriptors;
2. Identifying at least 100 LOpps;
3. Evaluating the quality of the LOpp descriptions.

These phases were conducted as part of a carefully designed collaborative process, with attention paid to collective definition of the criteria and the process, and to providing clear instructions for evaluation of the LOpp descriptions.

#### ***Phase 1: Defining relevant LOpp descriptors***

The ECCOE partners first defined the main required descriptors with reference to the European Digital Credential Infrastructure (EDCI) data model for LOpps. This entailed:

- Identifying relevant descriptors from the EDCI LOpp model;
- Classifying these descriptions into three categories:
  - Essential (=will be displayed in LOpp list, i.e. in a list which displays results from a particular search)
  - Important (=will be displayed in LOpp catalogue entry, i.e. the page in the catalogue which provides details about a single LOpp)
  - Background (descriptors which are important for searching / retrieving but which don't need to be displayed);
- Cross checking with descriptors external to the EDCI model, in particular course descriptors identified in other activities of the project.
- Internal peer-review and validation, giving rise to version 1 of the ECCOE LOpp data model.

#### ***Phase 2: Identifying at least 100 LOpps***

Quantitative: The project target was to analyse at least 100 LOpps in iteration 1 (with a further 100 to be identified in iteration 2).

Qualitative: As the aim of iteration 1 was to test version 1 of the ECCOE LOpp data model, LOpps could be taken from any source which provides an online description of a LOpp (course, module, MOOC or other type of formal or non-formal learning opportunity).

## **The ECCOE Approach to Quality Reviewing Online Descriptions of Learning Opportunities**

The main sources of LOpps were defined as:

1. MOOCs from the major MOOC platforms;
2. Modules/MOOCs/short courses offered by ECCOE partner institutions;
3. Modules offered by institutions/organisations that we know or trust;
4. Other (any module/MOOC etc. with a description online).

Examples of sources used were FutureLearn, MIT OpenCourseware, OpenupEd, FUN-MOOC, OpenClassrooms, Coursera, edX, Udacity, Udemy, and POK (Polimi Open Knowledge) as well as institutional offerings at UNED, UOC, VMU, DHBW, and LOpps offered or collected by other Erasmus+ projects, namely eLene4Life and OpenVM.

### ***Phase 3: Evaluating the quality of LOpp descriptions***

The process itself was subjected to two cycles of the Deming PDCA (Plan, Do, Check, Act) wheel (Sokovic et al., 2010). This process involved defining objectives for the activity, outlining the criteria for selecting and evaluating the Learning Opportunities and running at least 20 LOpps through the process before checking the process and results. Questions addressed included: Is the process clear to everyone involved? Is the process itself producing meaningful results? (i.e., is it helping to meet the objectives defined for the activity?). After this initial evaluation, which was conducted collaboratively during a focused online meeting of the ECCOE LOpp task force, any required adjustments were made to the process and tool and were validated collectively before continuing.

#### ***The process in detail***

The aim of this activity was to review the LOpps identified in the first iteration against the descriptors defined as required fields. The activity was divided into two steps: content analysis and technical analysis. For reasons of space restrictions, this paper is limited to the presentation of the content analysis.

### ***Content analysis***

In the content analysis there were two types of descriptor. The first type concerned fields where it was simply necessary to establish whether the information relative to this descriptor was present on the LOpp description page on the native (or host) platforms. For these descriptor types the answer was a binary YES or NO. The second type were fields which are frequently completed as free text, so where a more nuanced qualitative evaluation is required. The choices here were: YES (the information is present and of satisfactory quality); INSUF (the information is present but insufficient in quantity/quality or both); and NO (the information is not present).

### ***Technical analysis***

During the technical analysis, project team members identified the presence or not of the background information (i.e. data fields required to fully describe a LOpp in the ECCOE showcase catalogue, but which may not be clearly visible in the LOpp descriptions on their native platforms). The choices here were: YES (present and easy to find); YES-BUT (available but difficult to find); and NO (information not available or not found).

### ***Distribution of LOpps among partners***

Each partner reviewed LOpps in their own native language. LOpps in English were distributed among partners, and, in the case of several LOpps coming from the same provider (e.g. FutureLearn or POK), efforts were made to ensure that these were analysed by different partners.

### ***Criteria for initial evaluation of LOpps***

In iteration 1, our aim was to gain an overall picture of how LOpps are described on different platforms and to determine whether there were differences between the different types of providers (MOOC platforms, HEIs).

### ***Ranking and selection of results***

To support the classification and selection, a weighting system was implemented (Table 1). This weighting system measured descriptors on a scale of 3 to 1, where 3 indicated *information a learner absolutely needs* in order to know if a LOpp is interesting/relevant for them; 2 represented *information which would be useful* (but not absolutely necessary) for a learner to consider enrolling; and 1 implied *information which would be nice to have*, but that many LOpp descriptions don't (yet) provide.

## The ECCOE Approach to Quality Reviewing Online Descriptions of Learning Opportunities

Table 1: Descriptors and weightings

3: Weighting	2: Weighting	1: Weighting
<ul style="list-style-type: none"> <li>• Description</li> <li>• Discipline / subject area (which can also include transversal courses)</li> <li>• Description of learning outcomes</li> <li>• Entry requirements</li> <li>• Assessments</li> <li>• Type of credential</li> </ul>	<ul style="list-style-type: none"> <li>• Name of provider</li> <li>• Type of provider</li> <li>• Type of LOpp (e.g. degree programme, course, module, MOOC)</li> <li>• Language of instruction</li> <li>• Level (e.g., beginner, intermediate, advanced or similar)</li> <li>• Mode of learning</li> <li>• ECTS credit points</li> <li>• Start date (including any start date)</li> <li>• Duration</li> <li>• Workload (by hour)</li> <li>• Admissions procedure</li> <li>• Fees</li> </ul>	<ul style="list-style-type: none"> <li>• European Qualifications Framework (EQF) level</li> <li>• National Qualifications Framework (NQF) level</li> <li>• Learning schedule</li> <li>• Activities</li> </ul>

In addition to these, the descriptor “Hosted by” was also weighted as 1 as it is only relevant for MOOCs. Descriptors that concerned standard information (title, URL, contact details, etc.) were not taken into account.

## Results

In total, 133 LOpps were identified. Of these LOpps, 109 were evaluated, and 24 were eliminated as they were either not available at the time of the analysis (e.g., MOOCs no longer running, URL no longer valid), or were not available in a language understandable to any of the partners. Of the 109 LOpps evaluated, there were:

- 60 MOOCs offered by MOOC providers, HEIs, and European projects;
- 29 courses and modules offered by HEIs, including open universities;
- 20 other offered by national and regional consortia, private providers, and non-MOOC offerings by European projects.

## MOOC offerings

After application of the weighting, the scores for MOOC offerings ranged from 47 to 9 (median value of 36 and average of 32). The highest possible score a LOpp could have is 51. Table 2 shows the list of MOOC offerings for the top 20 entries (one third of the overall total).



# **The ECCOE Approach to Quality Reviewing Online Descriptions of Learning Opportunities**

Table 2: Top 20 MOOC Descriptions

Provider	Title	Score
FutureLearn	Veterinary Practitioners and the Food Supply Chain	47
OpenClassrooms	Improve your presentation skills	47
FutureLearn	Digital Photography: Creating a Professional Portfolio	45
FutureLearn	Online Teaching: Creating Courses for Adult Learners	44
FutureLearn	Microcredential in Business Management- Change Management	43
FutureLearn	Practical Project Management	43
UNED Abierta	Starting to write English with no mistakes: level B1	43
FutureLearn	Global Development in Practice: Designing an Intervention	42
Coursera	Know Thyself – The Value and Limits of Self-Knowledge: The Examined Life	41
FutureLearn	Introduction to Management and Leadership in Health Services	41
MyMOOC	Mixité dans les métiers du numérique	41
FutureLearn	Financial Analysis and Decision Making with Xero and Tableau	40
FutureLearn	FinTech - Financial Innovation	40
MyMOOC	Bien-Etre au travail	40
MyMOOC	Teambuilding essentials	40
POK	Entrepreneurs without borders	40
POK	Gestire il cambiamento	40
POK	Gestire il confitto	40
Coursera	Teamwork Skills: Communicating Effectively in Groups	39
edX	Introduction to Online and Blended Teaching	39

From Table 2, we can draw a general conclusion that the courses offered on MOOCs platforms were generally well described, as offerings from FutureLearn, MyMOOC, POK, Coursera, OpenClassrooms, UNED Abierta and edX comprise the top 20. The cut-off point for this top 20 was a score of 39. Below this, around half of the remaining MOOC LOPps had scores in the 30-38 range, with a further half in the 9-29 range.

The analysis was also supported by qualitative comments, two examples of which are provided below:

Veterinary Practitioners and the Food Supply Chain:

*“Level is postgraduate. Uses Common Microcredentials Framework (CMF). Admissions procedure and entry requirements are vaguely described in the FAQ; need to register with an account to get specifics (I think). Language of instruction seems to be only English (no other languages specified). UK credits: ECTS explained in FAQ.” (FutureLearn, 2020)*

Learn how to learn:

*“Short intros in the list of courses have EQF and NQF levels where they are applicable, although not in this specific case. The levels used on this platform are Easy, Medium and Hard. Learners can build their own schedule and*

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*there is guidance on workload depending on level of interest/involvement (very interesting feature).” (OpenClassroom, 2020)*

### **Institutional offerings**

After application of the weighting, the scores of LOpps offered by HEIs ranged from 43 to 5, with a median value of 26 and average value of 27 (Table 3). If the same cut-off point of 39 is used, only three institutional LOpps would be retained, so instead the top 10 are shown below, representing the same proportion (approximately 1/3) as for the MOOCs.

Table 3: Top 10 Institutional LOpp descriptions

Provider	Title	Score
UnivLorraine	Courlis statistique appliquée	43
UnivDerby_Open	Understanding Autism, Asperger's and ADHD	41
UnivCaen	DU Métiers de la Formation et du Développement des Compétences	40
UnivLorraine	NUMOC	38
UnivVMU_Open	European Criminal Law and Policy	37
UnivDerby_Open	GDPR: Data Protection Officer Skills	36
UnivJyväskylä_Open	Digital Competent Educators	36
UnivUAB_LLL	Qualification Course for Higher Studies (CQES)	36
UnivUNED	Simulation models for the design of transition paths towards a sustainable society	36
UnivVMU_Open	E-Learning Technologies	35

To be included in the OCLO, a LOpp must have a YES for all essential descriptors (those weighted at 3), then only eight LOpps are retained, all of which are MOOCs. This represents only 7% of the LOpps analysed, which is extremely low compared to our initial hypothesis of 20%. Of these eight MOOCs, three are from FutureLearn, two from OpenClassrooms, and one each from FUN-MOOC, OpenCourseworld and OpenVM.

The main criteria which resulted in LOpp exclusion from the OCLO were a) lack of information about learning outcomes and b) lack of indication of discipline. Both criteria to exclude Learning Opportunities in the analysis are extremely relevant. The reason behind the flexibility on assessing the second criterion is the high number of LOpps aiming at developing transversal skills in the analysed set.

### **Discussion and conclusion**

In this paper we have detailed the methodology developed and applied in order to analyse over 100 online descriptions of Learning Opportunities. The preliminary results show that while some MOOC platforms such as

FutureLearn and Coursera give a highly satisfactory level of information, there is still work to be done in order to provide learners with quality information regarding learning

### **The ECCOE Approach to Quality Reviewing Online Descriptions of Learning Opportunities**

outcomes. However, there is as yet little use of standardised vocabularies, such as the reference to international classification for organising education programmes, and related qualifications by levels and fields for the disciplinary fields (ISCED-F, UNESCO, 2015). Furthermore, competences and learning outcomes are rarely described in reference to standardised vocabularies such as ESCO (European Commission, 2020), the European multilingual classification of Skills/Competences qualifications and Occupations. Furthermore, these standardised vocabularies need to be updated to represent the increasing focus on soft skills. While ESCO does in fact include a whole skills category of soft skills, it is still not widely used by European MOOC providers, nor by European HEIs.

As a consequence, if the ECCOE project wants to reach its objective of developing a showcase catalogue of 60 LOpps, then a series of steps need to be taken before the second iteration. Rather than simply eliminate offerings because they do not meet the inclusion criteria, ECCOE takes a proactive and supportive approach, for example, by providing recommendations for improving LOpp descriptions. An agreement has already been reached with the OpenVM Erasmus+ project, and ECCOE project partners POK (the MOOC platform operated by Politecnico di Milano), Universidad Nacional de Educación a Distancia (UNED) and Vytautas Magnus University (VMU) will also receive recommendations for consideration. A further step is to ensure that the weightings and inclusion criteria are validated by two categories of external stakeholders. First and foremost, by learners and potential learners, and secondly by HEIs and corporate representatives involved in validating credentials. For this latter group, it is necessary to determine whether additional information provided in a LOpp description contributes to reinforcing trust in digital credentials or whether the credential itself is sufficient. Furthermore, it needs to be investigated if the ECCOE LOpp data model is complete, in other words whether existing LOpp descriptions contain additional fields that need to be included.

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## EPICA: USING AN EPORTFOLIO TO REDUCE THE SKILLS GAP IN SUB-SAHARAN AFRICA

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### Abstract

Consistent research has identified that a marked skills gap exists in sub-Saharan Africa (SSA). This skills gap results in high youth unemployment rates in a competitive market which has seen an increase in employers seeking specific skills when recruiting. To provide better opportunities for students entering the workforce the African HE system should adapt and search for innovative ways to respond to market demands. Universities can redesign the curriculum to focus on the key skills required by employers such as technical skills, transferable skills, and digital skills to address the skills gap in an attempt to reduce youth unemployment rates. EPICA, a strategic partnership between African and European institutions and organizations, highlights the important role that technology plays by introducing an innovative ePortfolio in universities aimed at showcasing graduates' employability skills. This project consisted of an empirical study demonstrating the implementation of the ePortfolio used to assess and present graduates' skills. The core findings suggested that a marked skills gap exists in graduate students' employability skills in SSA and that the ePortfolio provides a viable solution to reduce it. Results, strengths and limitations as well as ideas for future research are interpreted in the discussion.

**Keywords:** higher education, technology in higher education, skills gap, ePortfolio, online learning, eAssessment

### Introduction

Research has consistently attempted to understand the digital divide and extend the reach of education in developing countries of SSA, yet unemployment and informality remain a core issue. A combination of a skills shortage and mismatch, particularly among younger generations, appear to be at the root of this ongoing challenge (Betcherman & Khan, 2015). This skills gap, which is also closely related to the concept of employability, is the mismatch between the skills in demand by employers and those that potential graduate student

employees possess. Technological innovation in education has the potential to address this skills gap and provide students with further opportunities as it acts as a transformative complementary tool to traditional educational methods (Goh et al., 2020).

It is important to reflect upon the skills that employers consider as a basic requirement when recruiting. A recent report (Abedaki et al., 2015) highlighted the skills most demanded by employers in Nigeria: risk management skills, analytical skills, problem solving skills, decision making skills, leadership skills, communication and interpersonal skills, and proficiency in English. These results were echoed in Ghana, Senegal, Egypt, Botswana and Namibia (African Development Bank, 2017). There is also increasing demand for specialized skills such as in science, technology, engineering and mathematics (STEM; Leopold et al., 2017) and ICT skills (McCowan et al., 2016) in the African market. Despite a clear consensus in the skills required, there is a lack of sufficiently trained graduates in these areas (Leopold et al., 2017). Kalei (2016) reported that Kenyan graduates and young people do not meet the requirements set by employers in terms of skills. Adding to these problems are the data suggesting that the working population in the SSA is set to increase by 105 million people with 94 million of them living in the SSA region (International Labour Organization, 2017). It is vital then that these people do not become a part of the existing problems and solutions are found to help reduce the skills gap in this young and growing workforce (Africa-America Institute, 2015). Education provides a means to affront these problems, given that the level of education obtained is negatively correlated with unemployment rates, i.e. as education levels go up, unemployment rates are reduced.

### ***Unemployment in sub-Saharan Africa***

Recent graduates face a significant challenge when searching for employment due to a lack of work experience in a professional environment which impacts upon their ability to gain competence in the skills required by potential employers. Furthermore, employers often prefer to retain experienced, skilled workers instead of hiring recent graduates which increases competition for the available roles (Jiboku, 2018). Also, many employers report high dissatisfaction rates in terms of graduates' skills (Martin et al., 2017). Unemployment rates remain high, but this fluctuates depending on the industry with students of business and/or information technology offered more opportunities upon graduation (Leopold et al., 2017). Inevitably so, many companies fail to offer high skilled positions to recent graduates, increasing the skills gap further as those with experience gain further expertise, and those without being left behind (World Economic Forum, 2017). For those graduates that do find employment, many find themselves in positions that do not match their actual qualification level and competencies.

Equally, the pressure to meet the demands of the student body puts strains on the strategic and organizational planning of the courses. Employability skills are seldom the core focus in the curricula as a result with universities focusing on theory over practical skills (McCowan, 2015) which impacts on the development of transferable skills from the academic environment to the workplace (Leopold et al., 2017). This lack of focus on the practical application of skills via practices such as internships and volunteering are frequently referenced as a shortcoming in HE (Oluwatobi et al., 2017). Reports suggest that many students feel as though the skills they are being exposed to as part of their studies are irrelevant (McCowan et al., 2016). This perceived irrelevance is supported by the fact that students prioritise receiving high grades over developing the necessary employability skills (Kalei, 2016). Therefore, the African HE system should find innovative methods to adapt to the needs of this growing market and ensure that curricula design focuses on providing the necessary education in terms of theory and skills to meet the demands of the labour market to reduce the existent skills gap. Integrating a skill-based approach in the curricula via skill development programmes (African Development Bank, 2019) alongside an environment that aligns different stakeholder groups (WEF, 2019) could provide a solution to overcome the current challenges faced in the SSA.

### ***Reducing unemployment***

Given the challenges of unemployment in SSA, it is important to highlight potential factors that could reduce it.

The transition from HE to work is a complex one, influenced by an abundance of different factors including prior professional experience and development of the necessary skills to complete the job role (Fenta et al., 2019). But, how can education work towards fostering employability in recent graduates helping them meet the labour market demands? Firstly, universities can contribute to the development of job-specific skills and competencies given their importance in the consideration of graduate students' employability. Teaching a combination of both general and technical skills is highly valuable and universities can focus on this area to adapt to the market demands (World Bank, 2019). This encourages flexibility among learners who can engage in lifelong learning to keep up with the demanding pace of market demands. Thus, the role of the university is vital in providing students with the necessary skills to prepare them for current and future labour markets. Secondly, transferable skills for graduates seeking employment are a reliable predictor of future employability. Universities can develop these skills by providing a curriculum dedicated to their teaching and acquisition and by certifying the level of competence of these skills (World Bank, 2019). Transferable skills, particularly those related to cognition and adaptability are becoming increasingly more valuable to employers (World Bank, 2019). The University Qualification Framework (UQF, Tanzania Commission for

Universities, 2012) states that at national level graduates must demonstrate skills in problem solving, communication, decision-making and self-regulation. Similar expectations are seen in the Kenyan Qualifications Framework (UNESCO, 2015), highlighting the growing importance of skill development in African HE to reduce the unemployment rate. Thirdly, developing digital skills is of increasing importance as jobs tend to require ICT-related skills in developing countries (Broadband Commission for Sustainable Development, 2017). In Kenya, The Digital Economy Blueprint (2019) has focused on a conceptual framework to capitalize on the advantages found in digital technologies to improve Kenya and Africa's economic growth which creates jobs for works from a wide variety of backgrounds.

### ***The relevance of technologies in reducing the skill gap***

Advances in technology provide a significant opportunity to reduce the skills gap as evident in the so-called “digital disruption” which has impacted HE (de Wit et al., 2015; p.77). In Africa and Europe there has been a call to drive innovation using technology to improve HE. The African Union Commission details in its Agenda 2063 a need to focus on skill development, technology, research and innovation. Similarly, the European Commission proposed its Skills Agenda for Europe (EC, 2016) in which it highlights similar societal and educational needs as those mentioned in Africa. Accordingly, the EPICA project, co-funded by the H2020 Research and Innovation Programme of the European Union, was established in 2018. A strategic partnership between Africa and Europe EPICA was launched by an international consortium of European organisations (ICWE – Integrated Communications, Worldwide Events, International Council for Open and Distance Education, MyDocumenta, Open University of Catalonia) and sub-Saharan institutions (Africa Virtual University, Makerere University, Maseno University, and Open University of Tanzania). The overall goal of the project was to create a collaboration between these institutions and organizations to design an innovative ePortfolio to increase visibility of graduate students' employability skills and thus reduce the skills gap. The fundamental goals of the EPICA project were to encourage universities in their use of new active and blended pedagogical methodologies to meet the needs of employers seeking better-skilled employees, promote the students' visibility and awareness of the skills gained in the academic environment as well as in other applicable areas, and aid companies in recruiting candidates sufficiently skilled based on their needs.

To meet these goals, four universities (Maseno University, Makerere University, Open University of Tanzania, Open University of Catalonia) took part in a study which involved the use of specifically designed methodology for employability skills visibility, assessment and micro-credentialization. These were supported by a competency-based ePortfolio, implemented as a transition tool.



### ***EPICA methods and key findings***

EPICA used a mixed-methods exploratory approach which was implemented during the first year of the project. Firstly, a literature review was conducted. An empirical research study was designed and conducted with the aim of further understanding the perceptions of employers, civil servants, and academics towards recent graduates' employability skills based on the findings of the literature search. Quantitative data was obtained regarding these perspectives using a survey focusing on graduates' skills and identifying the skills least developed. This was then distributed at the Open Days in African Universities in 2018. During this event, 12 focus groups were held with regional stakeholders from the scientific and educational community, members of the business sector and the public sector. The perceived skill gap was discussed and qualitative data regarding this were obtained and analysed using Principal Component Analysis.

The key results identified in the project highlight the existing skills gap among graduate students' employability skills in SSA. Specifically, results suggested that said skills gap was particularly notable in terms of general knowledge employability skills (proactivity, technological knowledge, competences for working in a culturally and linguistically diverse context) as well as uncertainty management skills (ability to maintain performance under personal and environmental uncertainty). The role of the HE sector was also highlighted as the demand for quality HE, a lack of quality infrastructure, the use of rigid traditional methods over active educational approaches, a need for training for lecturers to support them in the practical application of skills, an overfocus on exams and grades over skills acquisition and poor communication between HE institutions and employers in the labour market appear to be core causes behind the skills gap.

### ***Discussion***

The skills gap in SSA is an area of great concern that can be addressed between HE institutions, the labour market, and businesses who must collaborate to adjust the curriculum and methodologies to develop the competencies proposed by university programs and subsequently meet the demand for professional roles. In this way, the stakeholders involved in this collaboration can act as agents of social change as they identify problems and promote education for a positive impact. This approach is thus a necessity in the long term goal of increasing employability and reducing the skills gap. This was demonstrated via the EPICA project which demonstrated the relevance of the aforementioned collaboration and fostered the integration of educational technologies to support graduate students in reflecting upon and demonstrating the valuable, transferable skills that they possess.

An important contribution of the EPICA project is the identification of an ePortfolio solution that supports the exploration of technology and digital tools as part of the academic experience and thus encourages a shift from traditional pedagogical models to learning experiences focused on employability and the development of the necessary skills associated with it (Palmer et al., 2017).

Despite the strengths of the EPICA project, limitations were identified. Firstly, shortcomings were revealed in terms of maturity in many of the universities that partook in the study when implementing the ePortfolio, particularly evident in the divide between human and technical readiness. Specifically, in the East-African universities ePortfolios are rarely implemented and there is a lack of support to encourage this implementation. This suggests that certain aspects of technology are not yet consolidated in the HE institutions which requires improvement. Secondly, teachers' maturity in terms of implementing educational technologies highlights another limitation which is supported by the extant literature (Aksit et al., 2017). Third, up to a fifth of students who participated in the project felt they did not possess the relevant digital skills to set up the ePortfolio, reflecting a perceived lack of digital competence among the target group of this project and potential barrier to the successful implementation of the ePortfolio itself. Overall, these limitations underline the need for an overhaul of the current educational system, modernizing it by focusing on practical and digital skills, to support graduates' needs in gaining the relevant skills necessary to find employment. The ePortfolio, as a strategic and transitional tool to follow up and evaluate the skills developed while showcasing their level of competence, which in turn increases employment opportunities can aid in this modernization to drive transformation beyond traditional pedagogical methodologies.

In light of these limitations, ideas for future research are considered. Going forward, institutions should look to adapting innovative practices to provide solutions to the problems identified. Specifically, an innovative pedagogical transformation is needed as it can address the skills gap. To achieve this, the following solutions are proposed: provide training courses for teachers to support adoption of active pedagogies, implement ePortfolios to enhance digital fluency, include stakeholders in the innovation process, and modernize the existing curricula with a specific focus on developing skills. Research should continue to investigate ways to include this focus both at local and national level to provide specific solutions for graduates and their skill development with the long term goal of reducing the skills gap while providing them with employment opportunities.

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## OPEN EDUCATIONAL RESOURCES IN GERMAN HIGHER EDUCATION – AN INTERNATIONAL PERSPECTIVE

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### Abstract

The term Open Educational Resources (OER) is buzzword in education systems around the world and their potential has even been highlighted with the pandemic crisis as an aid in education systems. However, it is still far from reaching the promises that were envisaged for them. This is especially true for Germany, where challenges have been identified in terms of OER infrastructure and adoption at a macro, meso and micro level. In this study, factors such as OER infrastructure, policy, quality and change are considered in German higher education from an international perspective (Australia, Canada, China, Japan, South Africa, South Korea, Spain, Turkey and the United States). As part of a broader research project, this comparative case study between higher education (HE) systems internationally provides insights into OER that could be useful for other HE systems, institutions and faculty members moving towards OER in these times.

**Keywords:** Open educational resources (OER), Germany, higher education (HE), comparative case study, international view

### Introduction

In a recent European index report on the readiness for digital lifelong learning (Beblavy, Baiocco, Kilhoffer, Akgüç, & Jacquot, 2019) that referred to learning participation and outcomes, institutions and policies for digital learning, availability and use of digital learning, Germany ranked on the last position (the 27<sup>th</sup>), despite its top ranking in ICT according to the ICT Development Index (ITU, 2017). The report highlighted that, “while Germany has a strong economy and fairly good education system, investment in digital infrastructure and programs is sorely lacking,” and “German policymakers are aware of the importance of digitalisation, but efforts to date lack ambition” (Beblavy et al., 2019; p.53). The German situation in terms of digital education has been covered by different

authors, even recently, against the pandemic backdrop. For example, Kerres et al. (2020) specifically addressed the “contradictions between Germany’s success in producing cutting-edge technology, and German caution when it comes to using digital technology in daily educational routines” (p.2).

When it comes to open educational resources (OER) and its infrastructure, recent reports highlight a similar situation. For instance, the UNESCO IITE (2019; p.27) stated that, “in Germany, OER adoption is also low, particularly outside the community of German OER experts in all sectors of education and training. OER are still considered as ‘not invented here’ by most educators”. For example, in higher education (HE), there are no guidelines/recommendations or national portals for knowledge/OER exchange. However, current projects are now addressing these aspects; for instance, the project EduArc (<https://uol.de/coer/research-projects/projects/eduarca>). This research project aims at modelling possible solutions to conceptualisations of either HE OER centralised repositories or hubs. In order to have the broader perspective in mind, an international comparative study covering different levels (macro, meso and micro level, see Zawacki-Richter, 2009) was conducted by the Center for Open Education Research – COER (<http://www.uol.de/coer>).

In the current study we analyse the case of Germany and summarise the main aspects for infrastructure, policy, quality and change in OER in HE, and compare it with selected international country cases, concretely the COER members’ countries of affiliation (Australia, Canada, China, Japan, South Africa, South Korea, Spain, Turkey and the United States). Therefore, this theoretical work is a summary of the results of the project devoted to the international comparison, including macro and meso levels, and the preliminary results of the micro level, which are currently being analysed.

## **Method**

The study is based on a comparative case study in which we examined the research questions in the countries as cases to better understand the topic of OER and their infrastructures at the macro, meso and micro level, without intending to draw generalizable conclusions (Yin, 2009). The data used for the study are the written reports by COER experts, which were mainly based on desk research.

The research questions of the study are follows:

- What is the situation of OER in HE in terms of infrastructure, quality, policy and change in different countries at the macro, meso and micro level?
- How are macro, meso and micro levels regarding OER in HE connected to one another in different countries?

## **Results and discussion**

We present a summary of the results according to the three above-mentioned levels in the different countries included in the study, starting with a more detailed description of the case of Germany. A final section synthesizes and summarizes the relationship between the levels.

### ***Macro level***

Contextual factors to understand national OER infrastructures, policies, quality assurance mechanisms and measures to promote change that were identified in the study were: each country's population, number of HE students, number of HE institutions, the balance between private and public HE system, the ICT development and the digital readiness. As a cornerstone element, the level of political structure centralisation impacted the four elements studied (Marín et al., 2020).

The case of Germany shows that many federal states are developing or have developed their own OER repositories (e.g. Baden-Württemberg), but there is no national repository, which also answers to the decentralised structure of the country in terms of education. The central hub that is one development option within the project EduArc may be an answer to that need (Kerres, Hölterhof, Scharnberg, & Schröder, 2019). In terms of quality assurance, there are no national quality frameworks for OER but rather some institutional and individual efforts. Policy at the macro level consists of national recommendations, but digital strategies are being/have been developed in nearly all of the federal states (Bedenlier & Deimann, 2020), although not all of them refer to OER explicitly. Government funding is the top-down driven activity for change. As a concrete example, a funding line targeted OER between 2012 and 2016 with different projects and services being developed, mostly devoted to promoting information about OER, encouraging educators to use and create OER and to develop some discipline-based materials (Mayrberger, 2019). In addition, there are other relevant organisms related to change and policy (Hochschulforum Digitalisierung). In this regard, Neumann, Orr, and Muuß-Merholz (2018, p. 259) remarked that “the coexistence and interaction of bottom-up and top-down driven activity is characteristic for the German OER movement”.

In the international context, the country with the highest level of centralisation in its HE system was China, which was the exception in terms of having developed national standards for OER and infrastructure quality. Other countries considered as centralised were Japan, Spain, Turkey, South Africa, Australia and Korea. In some of these countries, national infrastructures for OER in HE were found (e.g. South Korea, Spain) but in others these infrastructures only exist for other education sectors or for other types of resources (e.g. Turkey). Other countries had checklists, guidelines and evaluation guides developed



by relevant consortia/organisations (e.g. Australia, South Korea, Spain). In terms of policy, laws or regulations that include OER infrastructure were present just in some centralised countries (e.g. South Korea, Turkey). Highly decentralised HE systems were identified in Canada and the United States. As in Germany, education is a mandate of provinces or states, resulting rather in underdeveloped or non-existent OER infrastructures on the national level, and rather non-binding recommendations published by different actors concerning policy. For all countries, change happens mostly in the form of national funding initiatives and national digital strategies; despite this, change was reported to happen mostly at the meso or micro level in the majority of countries (Marín et al., 2020).

### ***Meso level***

The institutional context was diverse and main aspects that influenced OER infrastructure could not be easily identified. Even within the same country, diverse examples of HE institutions dealing with OER infrastructure were noted. However, national regulations, government support and university and faculty evaluation were especially important at the institutional level for some countries. University leadership and co-participation in the process of designing policies for OER were also factors considered. Some of these factors were also mentioned as enablers and barriers in the institutional context in previous literature; others include cultural/institutional norms, funding, institutional policies (Cronin, 2017; Murphy, 2013).

In the case of Germany, a high number of OER regional networks was identified in connection to the federal states or as concrete HE consortia within federal states or between them (less common). Examples were the “NRW Digitale Hochschule” with 43 HE institutions and the federal state ministry of culture and science in North Rhine-Westphalia, the “HE Network Digitisation of Teaching” in Baden-Württemberg or the Virtual University Bavaria. These consortia often developed OER shared infrastructures; for instance, the North Rhine-Westphalian consortium had a centralised HE OER repository, and the Virtual University Bavaria operated via a shared platform for the courses of the HE consortium. Regarding OER quality assurance, there were no institutional procedures, with the exception of the Hamburg Open Online University. In this context, of which a quality assurance framework and instrument for OER was developed (Mayrberger, Zawacki-Richter, & Müskens, 2018). In terms of institutional policy, only a few HE institutions had a strategy for digitalisation, usually developed by the university leadership (in some universities combined with co-design processes with the educational community), and many were working on it; nevertheless, not the majority of them addressed OER (Gilch, Beise, Krempkow, Müller, Stratmann, & Wannemacher, 2019). Up to date only Reutlingen University had a concrete OER policy; however, this was only a snapshot at the time of the desk research and needs to be revisited as more

institutions develop their digitalisation policies. Regarding change, federal state funding and policy were important but their translation into practice was rather dependent on the individual HE institution, HEIs also had their concrete funding schemes, e.g. for innovative teaching and learning concepts that include OER approaches.

In countries like China and South Korea, top-down institutional quality assurance mechanisms derived from national regulations were common. In other countries these were either non-existent (e.g. Australia, South Africa) or based on own independent institutional guidelines (e.g. Japan, Spain, Canada). Government support and university and faculty evaluations were key in China and South Korea to extend OER initiatives and shared infrastructure across their HE institutions and regional networks. University leadership in developing policies was common in countries such as South Korea, Turkey and Australia. In some HE institutions in Spain and Canada, this leadership was combined to some extent with co-design processes with the educational community (e.g. active consultation or direct involvement). OER policies were not common but present in a few HE institutions in Spain and Australia. Institutional change was mostly reported as a mixture of top-down (institutional strategy, university leadership) and bottom-up approaches in many countries (e.g. Australia, Japan, South Africa, Canada); although it was remarked that bottom-up approaches were more frequent. The role of the university libraries in OER was especially emphasised in some of the countries in the study (e.g. Australia, Canada, Spain).

### ***Micro level***

The results regarding the micro level are currently being analysed and data from some countries is still being collected. At this level, individual faculty's perceptions regarding OER and their infrastructures were the focus. For Germany, a survey is being carried out in order to collect these perceptions.

The OER Adoption Pyramid could be used as a framework for understanding the different factors that facilitate or hinder the use and creation of OER by educators in HE (Trotter & Cox, 2016), which in turn, are cross-sectional to the studied elements (infrastructure, policy, quality and change). The pyramid includes six factors: access, permission, awareness, capacity, availability and volition. While lack of access was mostly noted in the Global South (Cox & Trotter, 2017), aspects of awareness, capacity, availability and volition were among the most common in the countries studied in our preliminary findings. However, permission in terms of copyright licencing/policies by the institution was present in some of the countries (e.g. Turkey, South Africa, Canada).

In terms of awareness, Turkey's faculty members showed a low awareness regarding the philosophy of openness. In the Canadian province of Ontario, academics were rather

unaware of OER (Hayman, 2018) and these data seemed to reflect other provinces in the country, despite having several OER forerunners in some Canadian universities. In South Africa, an OER awareness seemed clear in some institutions, but academics had a limited understanding concerning open licensing formats and processes, especially regarding OER creation (de Hart, Chetty, & Archer, 2015). On the opposite side, Japan's academics were identified as well or somewhat aware of OER (Shigeta et al., 2017). Referring to OER policies' awareness, in China, faculty members had a low awareness regarding OER policies. Similarly, a majority of Spanish educators were not aware of OER policy procedures.

Concerning capacity, technical skills for using and finding OER were mentioned as barriers for OER adoption. For example, a shortage of digital skills among the educators was identified as a barrier in Turkey. In Canada, the need for educators to improve their OER-related skills, such as finding appropriate materials, was frequently mentioned. This connects to the factor of availability of OER and their repositories. For instance, the lack of appropriate OER was remarked by Canadian educators, referring to the OER fit to the teaching content and educators' standards. Similarly, Spanish educators highlighted as the most relevant reason for the lack of use of institutional OER repositories that they did not find OER useful for their teaching. The quality of OER and the lack of availability of context relevant OER, as well as the lack of adequate infrastructure to assist and support the use and creation of OER, were challenges highlighted by educators in South Africa (de Hart, Chetty, & Archer, 2015; Madiba, 2018). In Turkey, OER repositories did not function fully and had restrictions that hindered the dissemination of OER. All the countries studied emphasised the importance of faculty professional development and technical and pedagogical support to reach individual capacity, but also to increase OER awareness and understanding.

In terms of volition, resistance to adopt OER was identified in different cases, especially regarding the creation, sharing and remix of OER. For instance, Turkey's faculty members hesitated to open up their materials because others might use them for their own use (either for profit or not) and would not cite them. In the case of Canada, faculty members, with the exception of OER forerunners, did not want to release their intellectual property, but they would be willing to share within limited parameters – within their own department, for example, or with close colleagues. Most of the countries highlighted the lack of sufficient incentives for OER use and creation (e.g. South Africa, Canada, Spain), and suggested the relevance of establishing different types of incentives to support individual volition; e.g. monetary incentives (as in South Korea, China), faculty evaluation points (as in South Korea and Turkey), reduction in teaching load or assignment of teaching assistants (as in Japan, China).

### Macro, meso and micro levels

Although there are important differences in terms of OER infrastructure, policy, quality and change in HE in the countries studied, similarities in the relations between the levels seem to outnumber. In Figure 1 the relations are represented according to the corresponding level (macro, meso and micro level) and the elements studied (infrastructure, policy, quality and change).

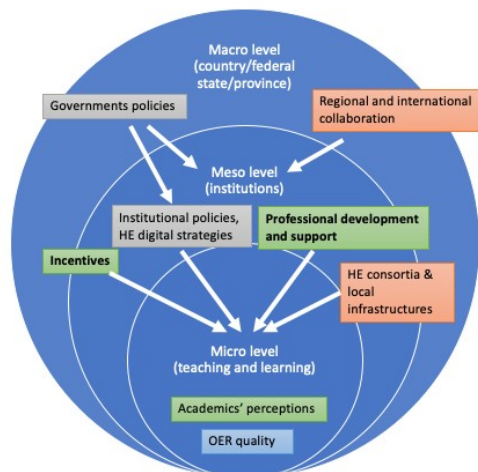


Figure 1. Relationships between the elements and the levels. Elements are distinguished by background colour (orange for infrastructures, grey for policy, cyan for quality and green for change)

The figure shows that relationships between the levels could have multiple factors and impacts, usually top-down. In the case of infrastructure and policy, there are clearly commonly top-down approaches that influence institutions and, in turn, the teaching and learning level. On the other hand, quality is mostly considered from a micro level perspective, even though international and national models may have a reduced impact. For the promotion of change, the application of incentives of diverse kind and the use of the institutional offer for professional development and support seem to be key for the OER adoption at the individual level. However, academics' perceptions are suggested to play a relevant role in the final step to adopt OER.

### Conclusions

According to Gumb (2020) citing DeRosa's words, "OER can remove barriers for students and faculty who need to shift to more ubiquitously available resources" and "Open is about public infrastructure more than it is a set of free textbooks". As it was evident in our comparative study, there are still many challenges to overcome for this to be a reality, despite the pressing situation in which OER are more relevant than ever. A good starting point seems to be the development of supportive open education institution policies that include incentives and capacity building within faculty members to work with OER, as it

was also recommended by Huang, Tili, Chang, Zhang, Nascimbeni, and Burgos (2020). Although this may prove to be useful at the institutional level, macro level aspects should not be underestimated, since they set up the general framework for HE in terms of infrastructure, policy, quality and change. On the other hand, micro level aspects are affected by both macro and meso levels, but it is ultimately individual faculty members who decide about OER use and creation. Therefore, these aspects should be considered within the whole OER adoption ecosystem (Cox & Trotter, 2017).

Despite the limitations of the study in terms of type of data collection, this study contributes to the field by offering an international view on OER from three interrelated levels and suggests potentials and difficulties of HE systems for other countries. Future research will include a deep analysis of the micro level.

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## EXPLORING THE IMPACT OF ACCESSIBILITY IN MOOC AND OER: A MULTIVOCAL LITERATURE REVIEW

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### Abstract

This report presents a review of the accessibility models in Learning Resources and MOOCs with the aim of establishing common terms in the research of the EduTech project and other projects associated with virtual accessibility in member HEIs. This study is based on the search and analysis of articles and publications related to the subject following the MLR format. The results showed a lack of applicability and data that support the current situation in Latin America, however, the experiences of European projects and regulations that support their sustainability, establish guidelines that could guide implementation processes in higher education institutions in partner countries

**Keywords:** Accessibility, MOOC, REA, MLR, virtual environment.

### Introduction

In recent years a rising awareness of the important of promoting inclusiveness in higher education has led to a surge in research and innovation related to the development of accessible learning opportunities across Europe and Latin America.

Establishing the relationships between concepts of terms associated with learning resources, learning objects, multimedia digital resources, is given by the importance of their use in virtual learning environments. The variation and growth of creating and managing learning resources are related to the exponential development of e-learning and virtual education.

Relevant research from Europe and Latin America set guidelines for the creation and management of accessible learning resources. In this study, concepts related to learning resources, virtual courses and MOOCs are analysed from the accessibility approach, based



on an online search of academic and grey literature relevant for the research questions. The experiences of the partner institutions of the EduTech project have also been taken into consideration. The article review indicates that several accessibility indicators involved in learning resources and MOOCs are related to WCAG compliance, usability, user experience, learning design, quality regulations.

The results of the research have shown that accessibility is transversal to the evaluation of educational resources and is considered within the tools and models to evaluate the methodology of a course and its technical aspects.

## **Background**

Virtual education is today the most widely used method in the training of most people, and even more so for those who have a disability. The world forum on education 2015 (Incheon Declaration, 2015) in its Education 2030 Declaration establishes that “It is necessary to take advantage of information and communication technologies (ICT) to strengthen education systems, the dissemination of knowledge, access to information, quality learning and more effective service delivery. It is necessary to identify characteristics that allow to strengthen compliance with digital accessibility”.

### ***Open Educational Resource – OER***

In 1994 Hodgins defined the concept of learning objects and received acceptance for the premise of ease of reuse (Rodriguez-Ascaso et al., 2017). Technological advancement and the use of digital resources in the mediation of learning, makes its concept constantly evolve. The definition of (Chiappe Laverde, 2009) as “... digital entity, self-contained and reusable, with a clear educational purpose, made up of at least three editable internal components...” and the constant coincidence in the characteristics of identification, recovery, detectability, reusability, and interoperability; allows you to delimit it but at the same time understand the variability and cultural evolution of its practice in virtual learning environments. It is in this evolutionary path that legal aspects and reuse licenses are established, which gives rise to the OER (Open Educational Resources). The term “open” involves active participation in 5 activities determined by (Wiley & Hilton, 2019) such as the 5Rs, retain, reuse, review, remix and redistribute.

### ***Massive Open Online Course – MOOC***

The acronym MOOC was coined in 2008 to refer to the course “Connectivity and Connective Knowledge” offered by Stephen Downes, Principal Investigator at the National Research Council of Canada and George Siemens Associate Director of Research and Development at the University of Manitoba (Shah, 2020; Sanchez-Gordon & Luján-Mora, 2018). The main characteristic of a MOOC responds to an open online course with massive

student participation. The materials of a MOOC could be protected by copyright – xMOOC or use and create OERs under a Creative Commons license – cMOOC (Rodríguez-Ascaso et al., 2017). There are several investigations that seek to classify or evaluate MOOCs. Based on learning characteristics, (Teixeira et al., 2019) points out that an iMOOC could highlight its focus on individual responsibility, interaction, interpersonal relationships, innovation and inclusion, or provide a learning experience marked by social interactions and participation considered as sMOOC (see Figure 1).

### **Relationship between OER and MOOCs**

Based on the contributions of (Rodríguez-Ascaso et al., 2017; Teixeira et al., 2019) the existing relationships between OER and MOOCs are expressed in Figure 1.

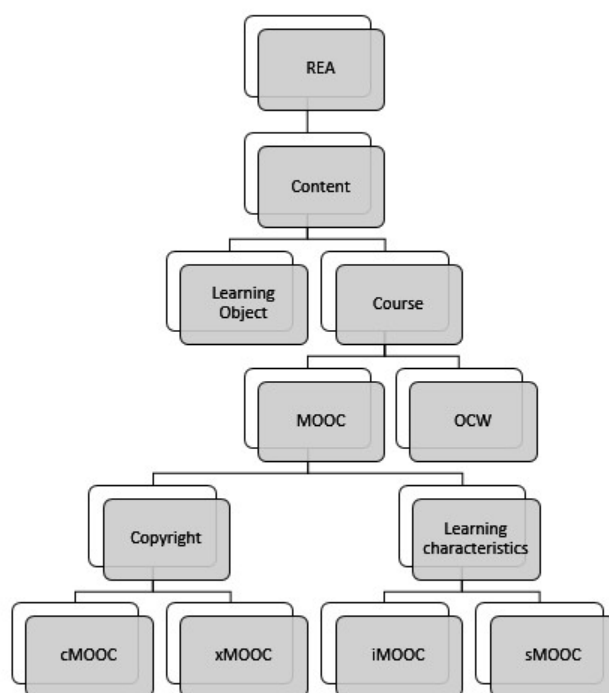


Figure 1. Relation OER & MOOCs

The existing relationship between OER and MOOCs converges in the identification of their content, whether it is treated individually as a learning object or within a course. Courses can be full, open but copyrighted, usually from an OCW university institution, or open, massive online courses, such as MOOCs. Accessibility is transversal in any of the defined components such as LMS, digital resources, learning objects, virtual learning environments and / or virtual courses and everything that converges in MOOCs and OER.

### **Accessibility**

Currently, universities face the challenge of providing quality education by strengthening the focus of inclusion and addressing the high rates of exclusion, discrimination, and educational inequality. The creation of conditions for the development of education for all,

which guarantees quality with equity, implies transformations in the educational system of HEIs, in their cultures, policies, and practices, actively and participatively involving evaluation processes that validate the efforts made. The (ONU, 2006) in the Convention on human rights and its Optional Protocol states in its article 24: “The States Parties recognize the right of persons with disabilities to education. With a view to making this right effective without discrimination and on the basis of equal opportunities, the States Parties shall ensure an inclusive education system at all levels as well as lifelong learning”.

The development of standards establishes rules and requirements that must be met, thus making it possible for the resources to be independent of the platforms, strengthening their interoperability, reuse, durability, updating, scalability, among others. With this, standards are generated for various areas related to learning resources and MOOCs. Teixeira et al. (2013) considers that accessibility in e-learning is not only framed in technology and its interaction, it also requires feedback from the design of learning experiences for all, considering in addition to technology and pedagogy, to ethics.

Methodological proposals focused on the quality of virtual educational resources are based on ISO regulations, establishing guidelines for applying ICTs in teaching, however (Amado-Salvatierra et al., 2018; Sanchez-Gordon & Luján-Mora, 2018) identify the lack of an accessibility methodology with a holistic and adaptable approach.

Regulations such as (ISO 9241-11, 2018; ISO/IEC 19796-3, 2009; ISO/IEC 24751-3, 2008) establish guidelines that are related to accessibility, however, the applicability and diffusion are still limited. In several countries such as Ecuador, the use of standards from private organizations is not possible until they are considered official standards such as ISO, which is why the WCAG could not be adopted until 2012 when the standard was created (ISO/IEC 40500, 2012) Information technology – W3C Web Content Accessibility Guidelines (WCAG) 2.0.

## **Methodology**

Studies related to accessibility in OER and their interaction on different platforms have been a considerable effort in addressing the variability of learning that all students present.

It is necessary to carry out a detailed search for accessibility indicators involved in learning resources and MOOCs, and the relationship it maintains with regulations, usability, user experience, learning design, and quality regulations. Accessibility is transversal to the evaluation of educational resources and is considered within the tools and models to evaluate the methodology of a course and its technical aspects.

It is intended to provide a global vision of the current state of initiatives in OER and accessible MOOCs and identify good practices for the creation and management

## **Research questions**

The following research questions are asked:

- RQ 1: How is accessible OER created and managed? This question is posed by the diversity of accessibility practices existing in accessible resources. To answer this RQ, relevant previous studies on accessible OER and the educational institutions that influenced their development were analysed.
- RQ 2: Can accessibility be mainstreamed in MOOC courses? The question is posed to establish the phase in which accessibility is considered within the creation of a MOOC course. To respond to this RQ, comparative studies of accessibility of MOOC courses and the establishment of applicable policies or standards in MOOC courses were analyzed.
- RQ 3: What models have been used to promote accessibility in MOOC and OER courses? The question is asked to establish models frequently used when considering accessibility in MOOCs and OER. To answer this RQ, this study investigated the models used in various platforms, identifying best practices, learning outcomes, and degree of satisfaction.
- RQ4: What are the challenges and opportunities that have been addressed in creating and managing accessible OER and MOOCs? The question seeks to establish present and future research trends in the subject of accessibility in OER and MOOC. To respond to this RQ, this study investigates the limitations of existing tools and systems related to accessibility in educational resources. It also summarizes and provides informed recommendations to overcome limitations.

The review of the state of the art on the creation and management of learning resources and accessible MOOCs is a topic that cannot only consider formal literature, the evidence and lack of a measurement consensus requires the inclusion of contextual information, corroborating scientific results with practical experiences. With this, it is necessary to incorporate GL (Grey Literatura) within the structure of the review protocol with the MLR (Multivocal Literature Review) methodology, based on SLR (Systematic Literature Review) (Garousi et al., 2019).

The inclusion criteria in the academic literature respond to being published in the period from January 2013 to December 2019. Writing in English or Spanish. The article must be related to the accessibility strategies in OER and MOOC. The article must respond to relevant research in partner countries or of high connotation in terms of accessibility. Exclusion criteria in the academic literature are those that are not related to accessibility and experiences in virtual education. In google Scholar it is considered the 200 most cited (citation index > 40)

In grey literature and GOOGLE, after fulfilling the search string, the first 100 searches are considered as inclusion criteria. As exclusion criteria in grey literature, advertisements and commercial images, documents not related to accessibility and experiences in virtual education, broken links or with access to buy books are considered

### **Quality questions**

In (QA1) the prestige of the author is evaluated where it is detected that all comply with the identification of the author and his expertise. The second criterion (QA2) evaluates the collection of data and procedures that respond to a research methodology and it is concluded that 26 articles present clear objectives and a methodological process supported by limited reliable references in a particular population or situation, 18 present a description of the approach proposed but lacks reliable references or little delimitation of the topic. The third criterion (QA3) examines the objectivity presented, it is concluded that of 35 articles the content of the source is discussed and supported by data while 9 refer to a discussion, however, the opinion is not impartial or is not supported by real data. The fourth criterion (QA4) assesses whether the source presents a clear date of elaboration before which 38 specify a clear date, 5 refer to a period but do not establish a specific date and 1 does not present date of elaboration. The fifth criterion (QA5) assesses whether there is an unpublished and significant contribution to the research, concluding that 28 articles provide innovation and reinforce or current ideas on the subject 13 articles reinforce current ideas, but do not contribute something unique to the research and 3 articles do not contribute innovation or novelty. In the case of GL, the type criterion is added for its quality evaluation and it is concluded that 12 articles are of the 1st level inasmuch as they respond to Books and journals of scientific dissemination and specialized foundations and 1 is considered of 2<sup>nd</sup> level because it is a presentation. See Figure 2:

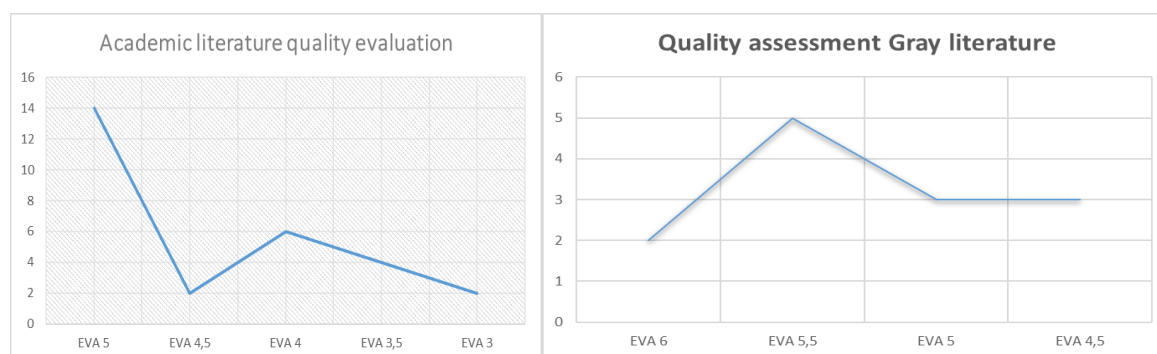


Figure2. Quality assessment

A three-value scale with different descriptions is applied to each question, and the results are used to summarize the quality of the included studies. For this study, the Krippendorff alpha ( $\alpha$ ) is also calculated for “nominal data, with two observers in order to measure the

agreement between 2 authors, who carry out the quality assessment independently in a sample of 18 publications.

The data is interpreted in a similar and acceptable way since the alpha value is 74.3%. In case of disagreement, a consensus is reached after discussion with a third author. Finally, a fourth author participates in the supervision of the process and in the establishment of the precision and reliability of the process and the final results.

## **Analysis of results**

The identification of relevant studies that were selected for this study are included in the analysis for subsequent discussion regarding the RQs.

Of all the studies, 43% of the selected articles were published in scientific journals, while 26% belong to highimpact conferences, 29% are articles and documents on the Internet, which constitute the majority of grey literature. The results of the 44 studies analysed in this research are presented in Annex 1. Each result is presented according to the corresponding research question.

In Figure 3 we can see the distribution of articles according to the year of publication. The interest in research associated with accessibility in MOOC and accessible OER presented between 2013 and 2019.

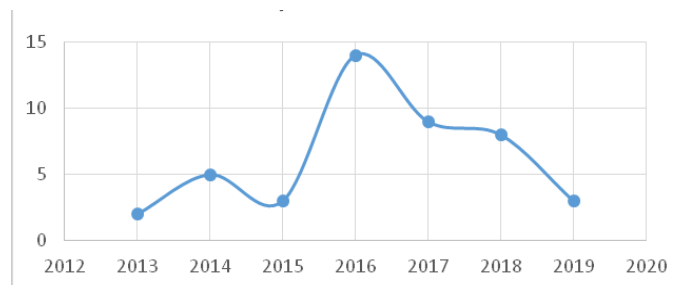


Figure 3. Distribution of studies by year of publication

The volume of publications will increase in 2016, a period in which local laws establish compliance with accessibility regulations, which is why virtual courses and research on the subject take a greater interest.

## **Conclusion**

As it is based on data from scientific literature and grey literature in a restricted period of time, we consider that the bias was reduced when covering the disciplinary fields of informatics, education, and the search for information and applicability experiences in developed countries and whose legislation endorses accessibility in virtual education.

There is a shortage of evaluation of accessibility in virtual educational resources and courses, endorsed by people with disabilities. The available studies tend to focus more on design recommendations than on evaluating the effectiveness of their implementation and improvement process. The use of accessibility standards is subjective, in several cases, it responds to evaluative models that, although they consider accessibility as an evaluative metric, it is inconsistent to reach a common implementation process, especially with courses that exceed the legislation of a country. There is a lack of references that establish an important sample of students with disabilities, their follow-up, monitoring, and improvement in the learning design, which requires a longer time to obtain reliability data.

The publication of accessibility information in educational resources, learning objects and MOOCs has a great influence on the effective response of personalized search engines according to the interaction requirements of an educational resource.

Finally, this study reveals that, although the contributions throughout history have generated standards and regulations that have motivated research on the subject, there is a lack of an ideal implementation and frequent use for its application, especially in developing countries. The information from quantitative, qualitative or mixed studies is insufficient to determine the impact on students with disabilities at a general level, so an audit and continuous improvement process is required that involves and commits all the actors within an educational project that supports an accessible MOOC and its learning resources.

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## THE OPENGAME COMPETENCIES FRAMEWORK: AN ATTEMPT TO MAP OPEN EDUCATION ATTITUDES, KNOWLEDGE AND SKILLS

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### Abstract

The paper introduces the competence framework produced by the OpenGame project, that includes the attitudes, knowledge and skills that educators need to master in order to work with Open Educational Practices (OEP). With this outcome, the OpenGame research team aims at closing the gap between the expanded interest of researchers and practitioners towards a holistic vision of open education and the absence of a shared competence framework that can cover both the creation and/or use of Open Educational resources (OER) and the broader realm of OEP. Starting from literature review complemented with the analysis of 24 open teaching practices, 8 competences have been defined, related to both OER and open pedagogies. The competences relating to OER are: use open licences; search for OER; create, revise, and remix OER; and share OER. The competences relating to open pedagogy are: design open educational experiences; guide students to learn in the open; teach with OER; and implement open assessment. The framework details the knowledge and skills that correspond to each competence and can serve both as a starting point to build educators' capacities to work with open approaches and as a reflexion tool to better understand what it means to be an Open Educator in the 21<sup>st</sup> century.

**Keywords:** Open education, OER, Open Educational Resources, OEP, Open Educational Practices, Open Pedagogy, Educators' competences, Higher education.

## Introduction

The concept of Open Educational Practices (OEP), defined as “practices which support the (re)use and production of Open Educational Resources through institutional policies, promote innovative pedagogical models, and respect and empower learners as co-producers on their lifelong learning paths” (Ehlers, 2011; p.3), has been gaining interest in the open education community (Bali et al., 2020), complementing OER as another fundamental pillar of openness in education (Havemann, 2020). OEP are potential enablers of quality, access and effectiveness within higher education (Wiley & Hilton, 2018), as recently recognised by the UNESCO in its Recommendation on OER (UNESCO, 2019). The number of universities that are working to mainstream the adoption of OEP across their educational offerings (Allen & Seaman, 2017) is increasing, and so are the capacity-building activities aimed to equip educators with the needed competences to work through open approaches (Nascimbeni et al., 2018). Nevertheless, what competences should be added to those already mastered by educators in order to upskill them into effective Open Educators is still an open question, and openness as an educator feature is a rather emerging area of research within open education research.

## Methodology

In order to close this gap, the OpenGame project consortium has been working to develop an Open Education competencies framework, mainly targeted at university educators but easily adaptable and applicable also to other sectors. Desk research was conducted to obtain evidence of professional competence requirements of educators in open teaching situations, aiming to identify the competencies emerging from existing Open Education courses, handbooks and guidelines for educators. The outputs of the first phase were categorised into eight fields of requirements, which we call “competence areas”, one on OER and one on open pedagogies.

A mixed desk and field research phase was then conducted to identify and analyse relevant open teaching practices, which resulted in the identification of the following 24 cases:

- Practice 1: Use open textbooks as teaching resources: the WikitoLearn example;
- Practice 2: Use a MOOC in the classroom;
- Practice 3: Implement “Open Flipped Classroom” teaching;
- Practice 4: Integrate course content with an OER slides playlist;
- Practice 5: Transform your course into a MOOC: the AMMIL methodology;
- Practice 6: Create an OER-based module for teaching foreign languages;
- Practice 7: Switch from a commercial textbook to an open textbook;
- Practice 8: Transform your MOOC into an OER;

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- Practice 9: Use open video tutorials to foster explorative learning;
- Practice 10: Co-produce OER through teachers' content clubs;
- Practice 11: Share innovative teaching practices through an online repository;
- Practice 12: Produce OER playlists with the help of Artificial Intelligence;
- Practice 13: Co-design your syllabus with your students;
- Practice 14: Use OER to support socialisation of perspective students;
- Practice 15: Use OER for personalised and inclusive pedagogy: the path-in approach;
- Practice 16: Edit Wikipedia in the Classroom;
- Practice 17: Make your course digital with the help of your students;
- Practice 18: Use Open Data as teaching resources: a case from social sciences;
- Practice 19: Assess students' work by sharing it publicly;
- Practice 20: Implement OER-based renewable assignments;
- Practice 21: Engage Students with Professional Communities of Practice;
- Practice 22: Collaboratively created online publications by students;
- Practice 23: Foster students collaboration through online dialogue;
- Practice 24: Use social media to build an open and collaborative learning environment.

A detailed description of these practices can be found in the Handbook produced by the OpenGame project (García-Holgado et al., 2020). For each practice we have analysed the competencies needed by the educator to engage in that specific teaching approach, either by discussing these with the educators implementing these practices, when possible, or through desk research. In order to confirm the components of the competences identified in the practice patterns analysis in terms of attitudes, knowledge and skills, we organised an online focus group with a number of open education experts. This work resulted in a framework that aims to be intelligible to both educators and practitioners in charge of building openness capacity within higher education.

### **The OpenGame competences framework**

The resulting framework is presented on Table 1. Importantly, the prerequisite of digital literacy must be kept into account. The reason for this is that, in order to effectively develop OEP competences and engage in the associated OEP, it is necessary to already have, or develop, a base level of digital competence, defined as the confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society (Redecker & Punie, 2017).

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Table 1: The OpenGame competences framework for open educational practices.

A. Attitude			
Be ready to openly share one's work, to use the knowledge created by others, in order to improve access, participation, and quality of teaching and learning			
Area	Competence	B. Knowledge	C. Skills
1. OER	1. Use open licenses	Understand the (comparative) advantages of using open licences and know the existing types of open licences	1.1. Apply an open license to teaching resources 1.2. Recognise the requirements and restrictions of a licence, and know how to determine whether a resource has a licence and of what sort
	2. Search for OER	Know OER repositories and identify those that are the most suited to open needs	2.1. Find OER that are relevant for own teaching 2.2. Assess quality and usability of existing OER in order to use them
	3. Create, revise and remix OER	Know the different options for adaptation of an OER (translation, illustration, accessibility, contextualization, etc.)	3.1. Create an OER, taking into account the specificities of licences as well as its potential for reuse (format, language, granularity) 3.2. Revise an OER, taking into account the specificities of licences 3.3. Create an OER composed of various OERs
	4. Share OER	Know OER repositories, how to publish an OER, how to share an OER	4.1. Identify relevant OER repositories and publish a resource 4.2. Share a resource through social media and other means
2. Open pedagogies	5. Design open educational experiences	Know how to share and/or work collaboratively with others in open communities, how to facilitate student engagement in open learning experiences	5.1 Design engaging open educational experiences
	6. Guide students to learn in the open	Know about connected and network learning strategies, Be aware of the issues connected to online privacy and personal data management	6.1. Support students to learn through social networks, online communities etc. 6.2. Provide guidance to students about online privacy and personal data management
	7. Teach with OER	Know how to search for, create, remix, and share OER, and how to facilitate and guide others in their engagement with OER	7.1. Support students in searching for and using OER (either collaboratively or individually) 7.2. Support students in producing OER (either collaboratively or individually)
	8. Implement open assessment	Know the comparative advantages of open assessment and be aware of existing open assessment methods and tools	8.1. Deploy OER within an assessment 8.2. Guide students in doing their work in the public 8.3. Guide students in producing OER for formative or summative assessment

## How to build openness capacity among educators

The OpenGame consortium recognizes that helping teacher developing an openness capacity is a complex task, and that academics need to start from their teaching practices in order to find ways in which they can share and collaborate openly, through a mindset shift (Inamorato dos Santos, 2019): a true change in the teaching and learning culture. Also, we note that openness is strongly connected with personal attitudes and preferences, and therefore generalist one-fits-all solutions should be avoided. On the other hand, as a fundamentally cultural transformation process, it requires time, appropriate pedagogical and technical support, as well as care for the educators own personal professional development pace.

Still, some guidelines can be drawn from the literature and best practices (Bali et al., 2020; Burgos, 2020) that can potentially increase the adoption of OEP within a university by improving faculty's capacities

- Creation of an Enabling Environment. Universities can play a critical role in supporting their teaching staff in the creation of open learning experiences, both through ongoing opportunities for professional development and by supporting in different ways the use of OEP and OER. What is important is the continuity of this effort, that should aim at creating an openness enabling environment, including clear guidelines on copyright and intellectual property rights (IPR), ICT support,

**The OpenGame Competencies Framework: An Attempt to Map Open Education Attitudes, Knowledge and Skills**

financial and non-financial incentives for educators that embark in open projects, etc.

- **Support Gradual Adoption.** Educators typically discover the benefits of openness starting from one aspect (often the use of OER) and then they move to explore other openness domains. University decision makers in charge of teaching innovation should consider that the adoption of open teaching practices, similarly to the one of general digital practices, needs to be supported gradually by letting time and space for experimentation and by making sure that different capacity building paths can be activated depending on the starting level of educators.
- **Support Community Building.** Typically, educators start exploring open approaches from a recommendation by a trusted colleague or because they see this being done within reliable communities of practice. These close collaboration circles seem to be the necessary step to move towards open approaches: collaboration is an integral part of OEP and of OER, therefore the existence of communities that can support and maintain these collaborations is key.
- **Support Grassroots Experimentation.** In order to foster ownership of open practices among educators, institutional open education initiatives should build on the individual initiatives of educators: this would help open education sustainability beyond the necessarily limited funding of institutional projects.

***Conclusions: How The OpenGame Framework can inspire the opening-up of Higher Education***

The Battle for Open (Weller, 2014) is a far-reaching ongoing process across the Higher Education sector for close to two decades. In recent years though open education has been a strong component of a wider movement promoting Open Science, extending the principles of openness to the whole research cycle (Burgos, 2020). This more recent concept has emerged from the convergence of pre-existent trends in higher education such as open learning and OER, open source, open access, open publication, open data, open peer review, open innovation, and open licensing. Other relevant components were added to the concept as well, such as scientific social networking and citizen science (Fecher et al., 2015).

Governments in Europe and elsewhere are promoting openness in science based on the social principle that education and research supported by public funding should not only be available for all, but should also stimulate everyone's participation (European Commission, 2016). An open knowledge ecosystem is thus being built with important implications on how the higher education, research and innovation landscape organizes and operates (European Commission, 2018; Burgelmann et al., 2019).

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From an HEI's perspective, embracing openness is therefore a necessity which implies a significant and broad change in the organizational culture, as well as in the practices and internal procedures. Starting by institutional governance, policies and strategic planning, and reaching such areas as the technological infrastructure, teaching and learning practices, faculty support and professional development (Castaño-Munoz et al., 2016). In order to be successful, it is recommended that a holistic and bottom-up approach should be adopted (Inamorato dos Santos et al., 2016).

The OpenGame framework represents an important contribution to trigger the complex and interconnected internal changes and adjustments needed for widespread implementation of OEP in HEIs. Although it focuses on teacher's capacity building it does so from a holistic perspective. The approach followed not only leads educators to understand the principles and values of open education, access and licensing, but also enables them to create and transform educational resources, design quality innovative learning experiences, teach and support students in open and personalised learning environments, and assess learning outcomes in new more engaging open formats. Another important feature of the OpenGame framework is that it is based on a broad and diverse selection of best practices which can be easily related to every teacher's own context and experience. Moreover, this was designed as an open framework and therefore it can be adapted and completed by the experiences collected and shared by the open practitioners which use it.

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## MODELLING TEACHER PRACTICES TO APPLY LEARNING ANALYTICS AS A METACOGNITIVE TOOL IN LEARNING TO ENHANCE STUDENT SUCCESS

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### Abstract

In the contemporary context, adoption of educational technologies has become inevitable. In virtual learning environments, teachers are not only exploring new ways of teaching, e.g. blended or online, but also incorporating various tools and strategies in order to facilitate the learning/teaching process. Learning analytics has received a lot of attention as it offers a support to teachers in monitoring students' performance and making decisions regarding pedagogical approaches and techniques that would enhance learning and fulfil students' realtime needs. In this research, a case study of university online or blended learning courses investigates the usage of learning analytics as a metacognitive tool to analyse how teaching and learning as well as learning design may be improved in order to enhance student success.

**Keywords:** Blended Learning, Case Study, Learning Analytics, Metacognition, Moodle, Online learning, Virtual Learning Environment.

### Introduction

The significance of online and blended learning has recently increased dramatically. However, teaching and learning in virtual learning environments is much different than in traditional face-to-face educational settings, and often it might be even more challenging on both students and teachers (Bennet & Lockyer, 2004; Oliver, 2001). Thus, teachers are obliged to explore the possibilities and features of virtual learning environments in order to create a coherent and comprehensive learning experience for students. Despite the fact that learning analytics (LA, henceforth) is quite a new phenomenon, its application has become a rather common practice within educational institutions that are trying to improve study experiences, raise overall quality of studies, increase students' motivation and learning success, and, finally, reduce drop-out rates. Besides, the application of

learning analytics can provide a comprehensive understanding of how teaching and learning processes work (Czerkowski, 2015). Taking into consideration the fact that many universities are moving towards online and blended learning, the main goal of this research is to examine the usage of LA as a metacognitive tool to analyse how teaching and learning, as well as learning design may be enhanced.

## **Learning Analytics for Enhancing Teaching and Learning**

To begin with, it is important to briefly explain the concept of learning analytics. One of the early attempts to explain the concept was made by researcher Siemens (2010), who claimed that LA is basically usage of data which is produced by learners in order to attain information that can be used to enhance the learning experience for the learners. Researchers Long and Siemens (2011) state: “learning analytics is the measurement, collection, analysis, and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environments in which it occurs”. In other words, LA can be described as a method used for evaluation and analysis of learner-produced data, attained from a virtual learning environment, in order to facilitate and to enhance learning and teaching processes.

Also, there is another way to explain the phenomenon of LA. For instance, the concept of LA can be understood in terms of its objectives. Researchers Diaz and Brown (2012) suggest that LA is all about collection, analysis, and interpretation of data that is either produced by or associated with learners and the learning environments where the learning process takes place. Here, the emphasis is laid on LA as a tool for observation and monitoring of learners’ activities and progress, which enables teachers to predict learning outcomes (Diaz & Brown, 2012). LA provides teachers with the possibility to examine learners and detect any subjects that the learner is or will be struggling with, then teachers can take certain steps to address these issues (Leitner, Khalil, & Ebner, 2017; Gasevic, Dawson, & Siemens, 2015; Greller & Drachsler, 2012; Fritz, 2011; Dietz-Uhler & Hurn, 2013). Indeed, application of LA may be rather beneficial when trying to improve learning and teaching (Diaz & Brown, 2012). LA can assist teachers in adjusting didactic content or approach, providing feedback, and selecting proper communicative strategies with the learners, especially with those who are at higher risk of dropout (Martin & Whitmer, 2015; Kim et al., 2016). Consequently, it can be stated that LA can be a rather useful tool for monitoring a learner’s progress and finding solutions to educational problems such as high drop-out rates, poor students’ performance, and learning design.

LA helps to understand learning and teaching processes in virtual learning environments (Czerkowski, 2015), which may be rather different from learning in face-to-face classrooms. Besides, application of LA may increase a teacher’s awareness of a number of

educational practices and support the development of various strategies that would help to enhance those learning and teaching processes (Siemens & Gasevic, 2012). In fact, application of LA may assist teachers in designing curriculum or selecting adequate teaching methods and techniques that would fulfil the learners' needs, and, finally, it may ease the transition from more teacher-oriented to a more learner-centred approach (Chatti, et al., 2012; van Harmelen & Workman, 2012; Siemens, 2015). Besides, some studies have revealed the fact that teachers often face some difficulties in designing course curriculum that would provide students with a coherent learning experience (Bennet & Lockyer, 2004). Taking into consideration the fact that LA is gathering learner-produced information from contexts where the learning process takes place, application of LA may support teachers in the development of course curriculum that would benefit learners by fulfilling their real-time needs, thus, it can be claimed that LA promotes the idea of personalized learning. Nonetheless, in order to design online courses for personalized learning, teachers have to demonstrate certain competencies and be familiar with the various features of a virtual learning environment, including LA (Salmon, 2000).

As already mentioned, LA assists teachers in monitoring a learner's progress and providing feedback. Considering the fact that learning/teaching and assessment processes are interrelated, teachers can use LA for the purposes of assessment, especially assessment for learning (AfL, henceforth), which aims at promoting learning. AfL not only encompasses such characteristics as metacognition, constructivist thinking, and collaboration (Swaffield, 2011), but it also strongly relies on data collection about the students' learning in a manner of feedback (Klenowski, 2009), which should be strictly directed to students' assignments and their learning process rather than leave any gap for false interpretations (Hattie & Jaeger, 1998). As Black and William (2009) note "evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers, to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have taken in the absence of the evidence that was elicited" (p.10). Consequently, it can be stated that the application of LA techniques can be useful for implementing assessment strategies that would enhance learning.

## **Metacognition and Teaching**

As it can be observed in the educational scholarly literature on online learning, perceptions of learning, effective learning, collaboration, self-directed or self-regulated and personalized learning have become of crucial importance. It should be noted that metacognition can be considered to be an inseparable part of the aforementioned and a critical element of successful learning because it deals with the self-regulation and self-reflection of a learning process (Medina et al., 2017). Metacognition is considered to play a

key role in supporting both students in their learning and teachers who are directing the teaching/learning process (Akpunar, 2011). Some authors support the idea that LA can be used as a metacognitive tool, which allows for reflecting on teaching/learning and developing metacognitive skills in both teachers and students (Durall & Gros, 2014).

Flavell (1979) introduced the term of metacognition and explained that it is a phenomenon which includes active control over cognitive processes in learning in two different ways such as one's thinking and learning and a critical awareness of oneself as thinker and learner. At first, metacognition was investigated in the field of developmental psychology (Baker & Brown, 1984; Flavell, 1987); later, researchers started exploring the phenomenon while looking at how educational experts engaged in metacognitive thinking and how metacognition can be used to enhance learning (Hatano et al., 1986). Furthermore, it should be noted that metacognition comprises two elements, such as a metacognitive experience and metacognitive knowledge, which refers to knowledge about certain cognitive processes and knowledge, controlling a variety of different cognitive processes (Flavell, 1979; 1987). Cognitive processes are dealing with the application of various strategies, including organizing, monitoring, and adapting; in the meantime, metacognitive processes are concerned with the monitoring and regulating of cognition (Pintrich, 2002).

Another interesting fact that should be mentioned is that there is a link between metacognition and critical thinking (Medina et al., 2017). Metacognitive strategies are necessary for the development of critical thinking skills (Halpern, 1998) because these strategies are used to control the thinking process (Medina et al., 2017). As a result, critical thinkers become responsible for their thinking process. To illustrate, critical thinkers employ various cognitive strategies to solve problems in a more efficient way; consequently, it can be stated that there is an awareness of control of the cognitive process (Halpern, 1998; Hessels-Schlatter et al., 2017). Thus, it is obvious that metacognition is related to critical thinking because metacognitive strategies are used to manage the thinking process.

When talking about metacognition in teaching, researcher Griffith (2017) has indicated that teachers should think about teaching and learners in a very systematic manner and also participate in a so-called “metacognitive decision-making” process which may result in more fruitful and appropriate didactic decisions. The fact that teachers are constantly re-thinking their pedagogical knowledge and pedagogical content knowledge enables them to improve their teaching expertise and choose most appropriate didactic approach and methods (Griffith, 2017). It is rather important for teachers to understand their beliefs, objectives, and knowledge about planning, assessing, and revising because this helps to

develop skills and knowledge to make fruitful decisions regarding teaching (Griffith & Bauml, 2016). Metacognitive decision-making in teaching includes identifying, drawing attention to, reflecting on, and evaluating teaching decisions and is the act of raising awareness about specific teaching decisions and the reasons behind those decisions (Griffith & Bauml, 2016). Therefore, metacognition can be treated as an inseparable part of the teaching process.

## **Methodology**

### **Case study**

A method of case study has been selected in order to reach the aim of the research, which is formulated as follows, to evaluate the usage of LA as a metacognitive tool to enhance students' learning success and to reveal teacher practices in using LA in the teaching process. Application of a case study research enables researchers to thoroughly examine teacher practices in using LA to design online or blended study courses. Besides, it should be mentioned that the research attempts to examine the usage of LA to increase the learner's metacognitive activities.

The research aims at providing answers to the following research questions:

5. Which data from learning analytics tools and which teacher metacognitive strategies may help to improve teaching and learning?
6. Which teacher metacognitive strategies, based on LA data, may help to improve learning design?
7. How can teachers create learner metacognitive strategies to improve the learning process?
8. How can teachers create learner metacognitive strategies to improve learning design?
9. Which Moodle tools are most reflected in case studies and teacher interviews in terms of creating metacognitive strategies?

### **Data Collection**

The data has been collected in semi-structured interviews with teachers and through observation and examination of 12 study courses in social sciences and humanities in Moodle.

### **Research Sample**

A total of 12 online and blended study courses that are taught at the university level for degree studies or continuous professional development (CPD) with allocation of study credits upon their completion have been chosen for the analysis to examine the way teachers apply LA to enhance learning and teaching. The study courses have been selected in regards to the following criteria: first, the course has to be either blended or online, then, the teacher agrees to share the contents of the course for the research purposes, teacher uses LA in the course, metacognitive strategies have been applied and are evident in the virtual learning environment, and, finally, the teacher has at least 5 years of experience in blended teaching.

### **Findings**

The study has revealed the fact that metacognition is often used in order to increase awareness of the students and to facilitate or enhance learning and teaching processes.

#### **Metacognitive Activities**

There is a lot of evidence of metacognitive activities in the analysed courses. Usually, both teacher and student metacognitive activities can be observed in the recordings of the lecture, synchronous online meeting activities, and course assignments.

#### **Metacognitive Strategies**

Teachers often apply metacognitive strategies when there is a need to establish a safe learning environment for students, to better understand what type of learners they are, and to learn about their learning needs and expectations. To illustrate, at the beginning of the semester, several teachers have asked students to introduce themselves in either the discussion forum, during video lectures or by preparing a short slide presentation:

*“Students not only have to introduce themselves in the first session, but also present themselves on the Moodle platform, in the study subject environment. It helps to create a sense of community between the members of the group and allows me to meet their learning needs by choosing the right direction for their homework.” (from the interview with teacher 2)*

#### **Profile Information**

The research has shown that teachers often check a learner’s Moodle profile information, which can be edited by the learners, and use log data, including access logs to Moodle and the time spent, and resources accessed in order to learn about how attentive a student is to learning the material:

*“However, here the data from Moodle logs was of great help, looking at the reasons why students failed at some of the assignments, trying to establish the link with the resources accessed (if they study resources provided in the course or not) and with their attendance in synchronous lectures or review of their records.” (from the interview with teacher 1)*

### **Learning Design**

The research has indicated that in trying to improve learning design, teachers spend a lot of time planning, selecting the material, types of assignments, and providing relevant information, including goals to be achieved, deadlines, assignments and criteria for assessment, and learning outcomes, in a very structured and clear way. The frequency and style of presentation of this kind of information depend on the individual teacher. For instance, some teachers provide a course plan with scheduled activities, learning objectives, outcomes and evaluation criteria as a part of course description, while others tend to provide students with learning objectives and tasks on weekly basis:

**Week 4. Solutions. Objectives:**

1. Finding and describing solution
2. Finishing a presentation
3. Reporting on events. Paraphrasing practice

Submit:

1. Presentation 1. First draft with voiceover due
2. Test 4

Figure 1. Example of Planning Activities in the Study Course on Moodle

### **Monitoring Performance**

Another important thing that the research has indicated is the importance of monitoring a student's performance through various Moodle tools because it enables teachers to identify, in realtime, the problems and difficulties, students are dealing with, and to come up with ways to improve learning design to better serve the learner's needs. The research has also suggested that teachers are actively using various internal Moodle tools such as discussion forums, logs, the activity completion tool, task assessment tools, progress bar, and calendar, as well as external tools, including Adobe Connect, Google docs, Padlet, and mapping tools in order to improve learning and teaching. However, some teachers note that students often do not evaluate the potential benefits of the progress bar, which would allow them to track their progress during their learning process and make them more autonomous and responsible:



*“Only a few students took advantage of the progress bar. And it was probably because they were not presented with its benefits but left to their free choice to use or not” (from the interview with teacher 2).*

Also, it should be mentioned that discussion forums have received a lot of credit when it comes to following students' progress. As a result, discussion forums can be rather beneficial in creating metacognitive learning strategies for students because the teacher can monitor student involvement and participation.

### **Feedback**

The research has emphasized the importance of feedback provisions. In addition to continuous monitoring of a students' learning process, feedback plays a key role in fostering learner's learning:

*“When a student reads another's work and provides feedback, he or she begins to re-evaluate his or her own work, thinks how he or she can better present, and often improves it. In this way, it is a dual benefit for the colleague and himself and a great responsibility that forces him to analyse deeper the subject and develop as learner.” (from the interview with teacher 2)*

In fact, feedback can serve a double purpose, e.g. feedback from both peer-students and the teacher helps learners in their learning process, while feedback from students to teacher can be used to improve learning design. Finally, the research has shown that the student's learning can be improved significantly if the teacher establishes the links between the assignments and learning outcomes, whereas, feedback is provided in accordance to clearly listed evaluation criteria.

### **Conclusions**

In short, metacognitive activities can be traced in all the courses analysed, e.g. in the recordings of the lectures, synchronous online activities, and various course assignments. The research has also shown that teachers apply metacognitive strategies when there is a need to establish a relationship between students and teachers, to find out more about students, and, overall, to create a friendly learning atmosphere. Furthermore, LA as metacognitive tool is often used to monitor students' progress and to evaluate how attentive they are to learning material. For that reason, teachers check students profile information and log data on regular basis. LA has enabled the monitoring of students' performances through a number of different tools, including internal Moodle tools such as discussion forums, logs, the activity completion tool, task assessment tools, progress bar,

and calendar, as well as external tools, including Adobe Connect, Google docs, Padlet, and mapping tools. The usage of such tools supports teachers in identifying real-time problems that students are facing, and improving learning design to enhance learning experience. Finally, the research has revealed that the provision of feedback becomes rather significant because it may facilitate student learning as well as assisting teachers in improving learning design to suit learners' needs better.

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## **ADAPTIVE LEARNING IMPLEMENTATION – A COGNITIVE DESCRIPTION EXPERIMENT FOR FIRST YEAR ENGINEERING STUDENTS AT A DISTANCE EDUCATION UNIVERSITY**

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### **Abstract**

A study was performed on a first year industrial engineering statistics course to improve the statistics pass rate. Statistics is a requisite for other engineering courses. The pass rate for the statistic course was below 50%. The primary purpose is to enable learners to build a capacity to comprehend module content and establish a deeper level of learning that will enable learners to achieve goals and objectives of T&L lessons. An intervention program was instructionally designed to develop a personalized and differentiated learning process that breaks down lessons into lower and basic components, for struggling learners, and improves lessons to a complex high level and challenging activities for excelling students. Forty students were considered for the study. Moore's theory of transactional distance was used as a theoretical framework. The data consisted of exam and assignment scores. A quantitative method was used to analyse the data. Hypothesis testing suggests that the intervention program is significant. The overall pass rates improved by 25%.

**Keywords:** ODeL; Scaffolding; Teaching & Learning; Learner support.

### **Introduction**

There is evidence that blended classroom models can be effective only when the online elements are active rather than passive, according to a 2010 department of education report, undergraduate students in blended classroom settings had better assessment outcomes than purely online or face-to-face classes. The reason being that blended courses in which the students are spending their time online solving problems, moving through the material at their own pace, and spending half of class time in the online component of the class, have more positive learning impacts than both face-to-face only and purely online only (Peters et al., 2014).

Experience with content comprehension struggles of a first year module students has led to the development of an idea that student need a differentiated approach and different learning techniques, offering the best from both components of a blended course. It is apparent that for engineering students pacing is needed and learning must be possible on more platforms than just on the LMS. Therefore, a T&L approach that provides a better control to the learner and is supported with online resources is indispensable (Peters, 1994). Thus, an active technology integrated T&L approach is critical for throughput improvement.

Learning may mean acquisition of knowledge (what knowledge?) And/or deepening of understanding (of what?) And/or acquisition and improvement of both technical and interpersonal skills (which skills?) and/or development of desired attitudes and values (which attitudes and values, and desired by whom?) Understanding, skills attitudes, and values are all highly subjective constructs. Studies have shown that the more students work in cooperative learning groups the more they learn, the better they understand what they are learning, the easier it is for them to remember what they learn (Johnson et al., 1998a-c). Springer et al. (1999) meta-analysed the research for college-level science, engineering and technology and found significant effects on students' persistence and achievement in these fields and positive attitudes toward their education.

Therefore, a system with the ability to adapt intelligently to goal, tasks, interests and other features of individuals and groups of users, is an ideal engineering technology education medium. In an ODeL institution, access is given to all potential students with varying grade 12 scores and therefore different competencies of the basic engineering modules such as mathematics and science. Some student have poor grades, while others have very good grades, thus in the teaching and learning process, It is not more possible to treat all students in the proliferating range of e-learning users with very different prior knowledge of the domain, backgrounds, learning styles, interests and preferences, with the "one size fits all" approach. Therefore, adaptation of the learning process and assessment is indispensable.

The power of this innovation is in matching the educational content and the complexity or simplicity of the material, with the learning style of the learners and giving consideration to the underlying pedagogical principles. The effect of the combination of strategies is observed and comprehended by analysing the assignment scores of learners and therefore, making a decision to adapt learning content by increasing the complexity of the problems or simplifying content. Since the learning styles are not static (Siadaty & Taghiyareh, 2007), assessment, alignment and adaptation is done continuously throughout the learning period i.e. semester or year.

## **Theoretical Framework**

Introduced in the early 1970s, is the theory of transactional distance by Michael Moore. Moore recognized the limitation of the structure of the independent learning package by including dialogue as a second variable. Moore's theory of transactional distance is intuitively appealing and moves the field toward the realization of a pedagogical theory. According to Moore (1991), transactional distance is pedagogical, not geographic, and necessitates "special organizations and teaching procedures" (p.3) composed of two variables (clusters, dimensions?), i.e. structure and dialogue (Moore, 1991; Moore & Kearsley, 1996). Structure reflects the course's design and is largely a function of the teaching organization and communications media employed.

On the other hand, dialogue is also associated with the medium of communication and may include either real two-way communication or Holmberg's internal didactic conversation. In Moore's theory, the most distant program has low dialogue and low structure while the least distant has high dialogue and high structure (Moore, 1993). The innovation applied to improve student performance deals with Moore's pedagogical variables of transactional distance. The innovation works on structure as it relates to course design and communication media employed. It is also deals with dialogue, for the engagement between student and instructor is bound to increase.

## **Approach**

The study is focused on first year engineering student, who have taken engineering statistics for the semester. Analysis is done on the results of the first assignment to measure the impact of the innovation on student performance. Adequate supports is provided for students with different learning styles. Ally and Fahy (2002) found that students with different learning styles have different preferences for support. The difficulty level of the material is set to match the cognitive level of the learner, so that the learner can both attend to and relate to the material. Cognitive description is applied on the result and student are grouped according to their performance. Poor performing students are placed on a pacing and an instructional scaffolding teaching program and excelling students are placed on an adaptive learning and gradual release of responsibility program.

## **The experiment**

Applied techniques for mapping this approach into practice are: providing a pre-test, breaking off the learning material into small pieces, sequencing the material from easy to more difficult and providing links for further exploration to fulfil this characteristic of sensation seeking learners. This approach is implemented by applying methods such as providing the summary and outline of the content, chunking the educational material into

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meaningful groups and giving the learners the opportunity to revisit topics to strengthen their retention. In order to evaluate the proposed framework experimentally, an investigated hypothesis was that: Matching the educational contents with the learning style of the learners along with considering the underlying pedagogical principles, affects the performance of the students in terms of learning outcomes.

Table 1:

Research Question	Hypothesis	Prediction
Does, the matching of educational contents with learning styles of learners and underlying pedagogical principles, affect learners performance outcomes?	Matching the educational contents with the learning style of the learners along with considering the underlying pedagogical principles, affects the performance of the students in terms of learning outcomes.	If I match module contents with the learning style of the learners along with considering the underlying pedagogical principles, learner's performance outcomes will improve.

The experimental group were provided with the personalized contents based on their learning styles whilst the other group was given the non-matched contents, originally designed for that course. The limitations of the study are that (a) since learning styles are not static, initiating the T&L framework once (per group) when learners first use the system, might not be adequate enough. (b) It is possible that learners are not assessed as effectively as they might have been. (c) The lack of professional skills in psychology limits the application of LSP to increase self-awareness and metacognition of learners.

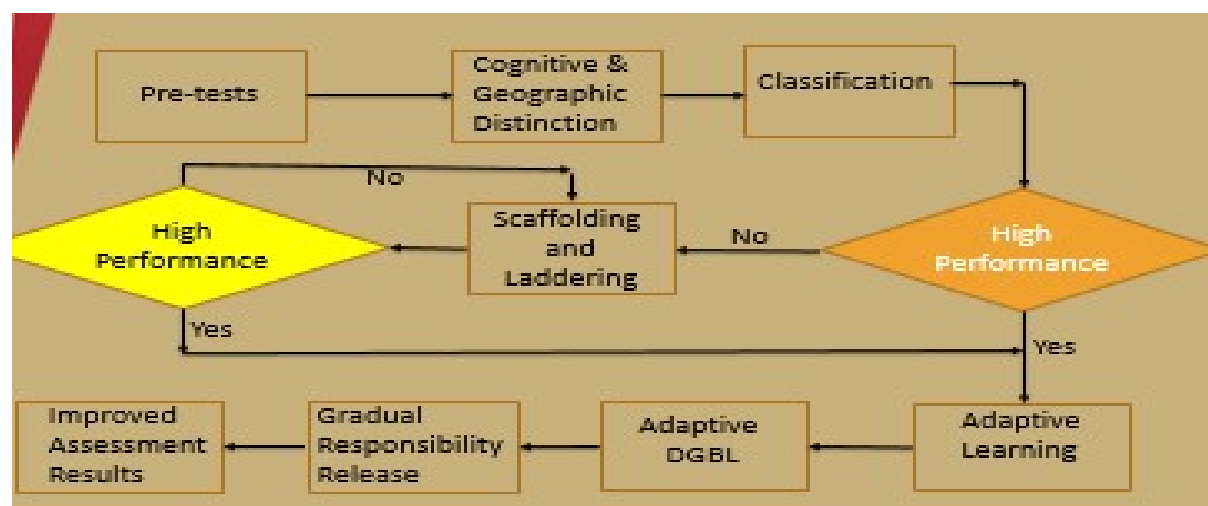


Figure 1.

Application of teaching technologies, learning objects and instructional support media tools to enable learning possibilities, when-ever, where-ever and on what-ever device student have access to at a point in time, is key to the innovation employed. This strategy consists of a representation of learning materials that the learner can engage and includes a set of domain concepts such as facts, lessons and activities organized to form a kind of a



semantic network as stipulated by Siadaty and Taghiyareh (2007). At this stage numerous instructional support material such as OERs, LO, MOOCs from other institutions, are used.

## Results

Results of the impact of the innovation on student's performance are displayed below. There is a general increase in pass rate for the years 2015 to 2018. These results imply that the innovation has a positive impact on the combined learner's performance. Note that these results represent both excellent students and students who were struggling in the beginning of the semester.

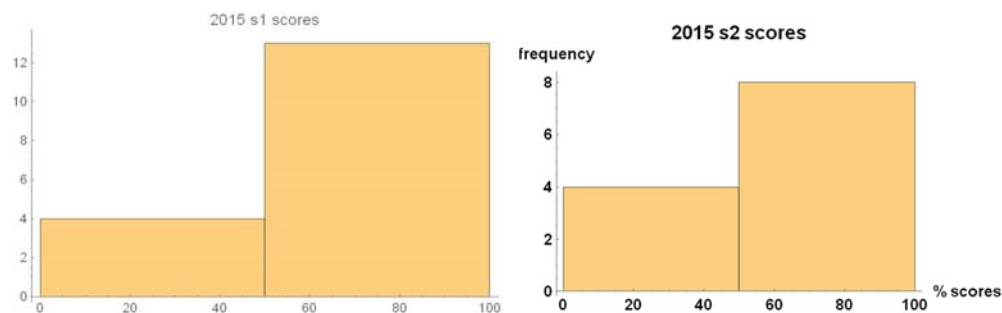


Figure 2. Assignment scores for S1 and S2 in 2015

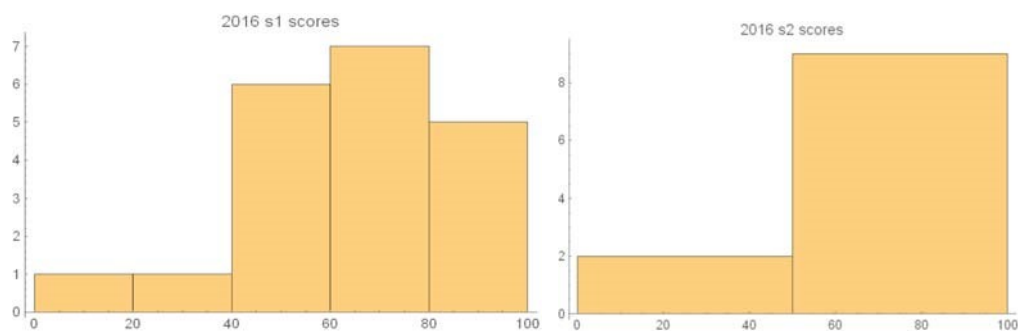


Figure 3. Assignment scores for S1 and S2 in 2016

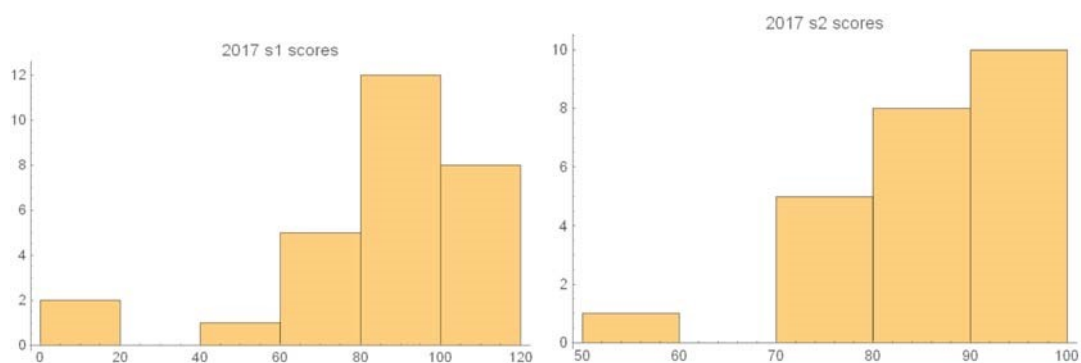


Figure 4. Assignment scores for S1 and S2 in 2017

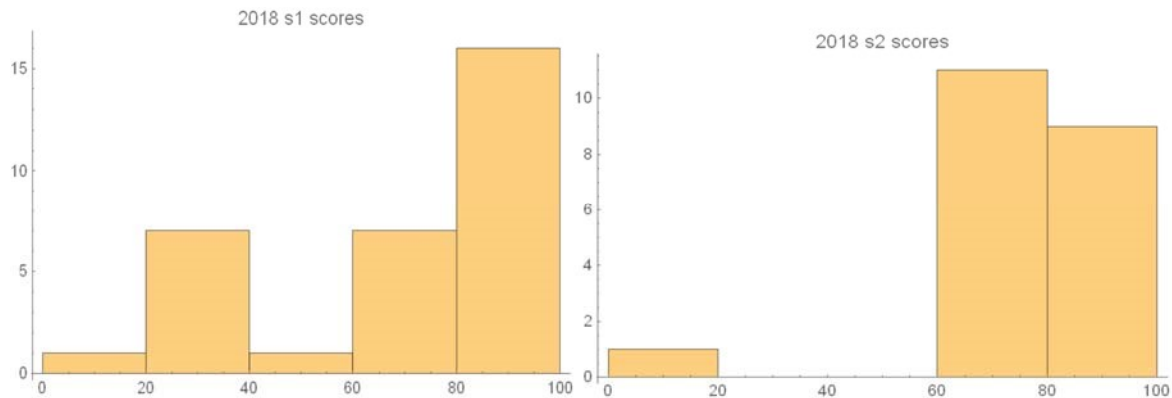


Figure 5. Assignment scores for S1 and S2 in 2018

In the beginning of the program there are clearly two homogenous groups of student, i.e. a big group of struggling students and another big group of good performance students. In the subsequent years, student performance began to stratify, and there are new groups formed, i.e. a small group of utterly struggling students and numerous groups of students with improved performance and a sizeable group of excelling students.

## Discussion

An intervention of a teaching program which was instructionally designed to develop personalized and differentiated learning process for students, through breaking down lessons into lower and basic components, for struggling learners, and improves lessons to a complex high level and challenging activities for excelling students, proved to have produced positive results. First, the struggling students group is reduced gradually and the excelling students group is increased. Second, the two homogenous groups of good performance and struggling learners gradually disappears and they are replaced by numerous and smaller groups of learners performing above 50%.

Towards the end of the study, i.e. 2017/2018, it becomes apparent that the group of excelling students increases and that of struggling students decrease significantly. It is also clear that more learners have improved their performance above 50% and a large group is in the category of excellent performing students. The innovation introduced has improved student performance gradually and increased the number of excelling students. In general the student success rates has been increased and performance improved for a large number of learners for about +25%.

## Conclusion

It is evident that this innovation integrates Moore's pedagogical variables, i.e. structure and dialogue, and builds a new conception for the four component of the intelligent tutor system (ITS), as inspired by Bloom's learning theory (Springer et al., 1999). The resultant is that student have an integrated view of the instructor's responsibilities (Petocz & Reid,

2003). They expect lecturers to be a catalyst for their learning and help them to change their view of the world of teaching and learning statistical content. Therefore, lecturers are seen to open students' minds to new possibilities and better performance.

This conception of teaching and learning is different from the common and general method, because it focuses on helping students to develop a higher level of comprehension of subject matter content. Therefore, the innovation implemented confirms that it is no more possible to treat all students in the proliferating range of e-learning users with very different prior knowledge, backgrounds, learning styles, interests and preferences, with the one-size-fits-all approach. It is thus, confirmed that when module contents is matched with the learning style of the learners along with considering the underlying pedagogical principles, learner's performance outcomes will improve, and therefore the hypothesis is confirmed.

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## THE USE OF MACHINE LEARNING IN EDUCATIONAL DATASETS

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### Abstract

The use of machine learning in educational datasets can be very important in predicting and detecting different behaviours related to education, so knowing the most useful techniques that help to effectively analyse these datasets will be very beneficial for any type of machine learning that needs to be performed. This paper explains the typical and common workflow for machine learning with educational datasets (interpreting the term *machine learning* as the algorithms that learn from data automatically), especially focusing on the pre-processing of these datasets, a process that takes place before machine learning algorithms are performed.

**Keywords:** Machine learning, data science, datasets, education, workflow, pre-processing, outlier detection, imputation of missing values, data transformation, dimensionality reduction.

### Introduction

The use of machine learning extends to almost any field one can imagine, such as cybersecurity, computer vision applications, medical analysis, economic predictions, sentiment classification, or even the discovery of hidden patterns in student data. In short, the applicability of machine learning is so high that it is understandable that several techniques and methods were created to approach with guarantees of success any machine learning project.

Therefore, knowing the most basic aspects of different machine learning techniques will be very helpful to accurately and correctly decide the most appropriate workflow for every specific problem, but first, it is crucial to explain some basic foundations on machine learning and the techniques around it.

## **Definition of machine learning and importance of data science**

Data science and machine learning are among those fields that have been generating the most impact in recent years, mainly due to their usefulness in practically any sector. As a result, the vast amount of research being carried out today produces an enormous amount of techniques, concepts, methodologies, good practices and, ultimately, computational tools that, when put together, could overwhelm any engineer. In addition, it is very likely that the concepts of machine learning, deep learning, data science, big data, etc. seem equivalent, and although the differences between any of the previous terms are not entirely clear, there seems to be a certain generalized approach based on the Venn diagram developed by Drew Conway (2011) (Figure 1).

As it can be seen from Figure 1, machine learning uses hacking skills and statistics and mathematics as the only components. In addition, it is interesting to highlight the role of data science, since it brings together all the existing concepts and skills, and therefore, many of the techniques that help improve machine learning performance come from data science rather than machine learning itself, a field that could concentrate machine learning algorithms exclusively.

Leaving Drew Conway's diagram aside, machine learning could be defined in different, more formal ways such as:

*“Machine Learning is the study of computer algorithms that improve automatically through experience” (Mitchell, 1997)*

*“A machine learning algorithm is an algorithm that is able to learn from data” (Goodfellow et al., 2016)*

Thus, the emphasis placed on performing some intelligent learning behaviour is more formally appreciated, and not so much on optimization and filtering techniques, more typical of data science.

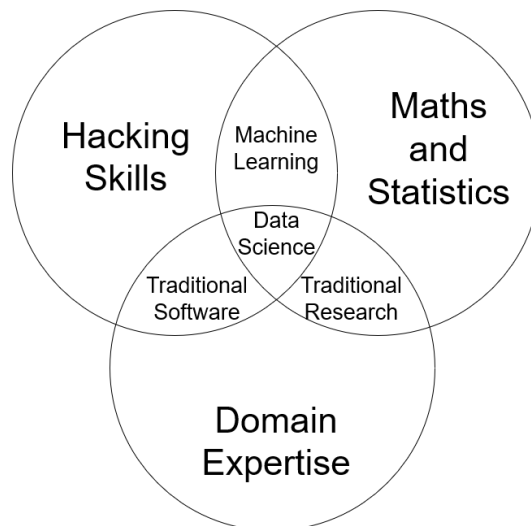


Figure 1. Venn diagram of Drew Conway

### **Importance of machine learning in education**

Until not many years ago, major education-related studies tried to maximize student performance, classify students, decrease absenteeism in university students, etc. with classic strategies of motivational assessment (Ryan & Deci, 2000), gamification (Domínguez et al., 2013) and socialization by developing gamified platforms with which students would find motivation and enthusiasm for learning, by developing attractive practical activities, or even by implementing platforms with social media elements (De-Marcos et al., 2016b; 2016a; 2014) that would positively impact the academic environment.

In short, the interest in improving and understanding the educational field is of considerable interest in the scientific community, and therefore, it was a matter of time before machine learning emerged as a key and fundamental tool in many of the research that is carried out today.

If one looks at the data (Wallace, 2019; Carter, 2019; ODSC Community, 2019), research on the application of machine learning in education has a major boost in countries like U.S. and China, both investing millions of dollars in research and development. Thus, many of the benefits expected in the near future may be:

- **Precise grading:** Many education professionals aim to unify the evaluation system and eliminate the bias while teachers evaluate their students. A current example is that of 60,000 Chinese students whose essays were evaluated using AI almost as accurately as a real teacher would do (Wiggers, 2018).
- **Predicting career paths:** It is estimated that only 10-15% of U.S. students know which path to select after graduating from school, therefore, using machine

learning tools to objectively advise each student based on their skills and interests could greatly help them choose the right path.

- More personalization in classrooms: Adapting the learning methodology is vitally important to maximize the potential of each student, especially when it comes to students with some kind of learning disabilities.
- Preventing student dropout in distance learning (Kotsiantis et al., 2003) by implementing a machine learning algorithm that recognizes students with high dropout probability.

The growing importance of this type of research and development requires an operating methodology that maximizes the chances of success when using any type of educational dataset. In this way, the main objective of this paper is to explain, in a conceptual and simple way, the main steps when tackling any educational dataset through machine learning, making special emphasis on the data science phase in charge of filtering, processing, correcting and maximizing the importance of the dataset to be used in the machine learning algorithm.

## **Essential steps in manipulating educational datasets**

When it comes to pre-processing an educational dataset there are many techniques that can be used, and therefore, the data scientist must choose the most appropriate techniques in every case, since each dataset is different and will require different processing.

Among all the available techniques, we will develop the most relevant ones in the following sub-sections.

### ***Imputation of missing values***

Empty values are very common in datasets, and if they are not correctly processed, they may make it difficult to create machine learning models, so addressing the problem of empty values in datasets is vitally important.

Generally, when the dataset has many samples and the number of empty values is very small (less than 5%), we can ignore those samples without too many consequences, but when our dataset is scarce, deleting certain samples can generate a great loss of information for our machine learning algorithms, which could be solved with the use of some missing value imputation technique.

A simple way to impute missing values is to calculate the mean of each attribute from the observed values, and impute the result obtained from the previous operation in each of the empty values. This simple technique is called *simple imputation*, but it has the great disadvantage of distorting other properties of the variables, such as the variance.

In other peculiar cases, such as time series data, the method can be sophisticated by just taking a moving window or margin, and then replacing the missing values with the mean of all the existing values in that window. This imputation technique is known as the *moving average method*.

Another interesting way to carry out the imputation of empty values is to impute impossible values, for example negative values in properties that are always positive, to simply carry out a quick test, leaving the imputation for later with some advanced technique. However, this technique is only used for getting a fast analysis that provides the data scientist with some valuable information, and should not be used for models intended for production.

Although the previous simple techniques can get someone out of trouble, much more sophisticated and elaborated algorithms are usually used, and those sophisticated algorithms use complex techniques such as multiple imputation (Rubin, 1978), bootstrapping, PMM (predictive mean matching), etc.

Many of these advanced algorithms are available in the major programming languages used for machine learning. For example, one of the most powerful algorithms in the R programming language is MICE (van Buuren & Groothuis-Oudshoorn, 2010), and its choice to impute empty values in an educational dataset can be very beneficial.

### **Outlier detection**

Outlier detection is the process of finding data whose values move away from normal ones.

Outliers are generated for a variety of reasons, but it is usually due to sensor errors or human errors and manipulations. However, in some cases it is possible that the outlier comes from totally valid natural reasons, and the data scientist in charge will be responsible for interpreting and reasoning the appearance of such outlier, since it is quite possible that some novel and valuable behaviour has been discovered by chance.

Whatever the reason for the appearance of the outlier, its detection is crucial so as not to worsen the performance of the machine learning process, since the presence of several outliers in the learning could have unfavourable consequences for the generalization and accuracy of the learning performed.

The detection of outliers firstly goes on to distinguish two criteria: depending on the context and according to the dimensionality:

- Depending on the context:
  - Global outlier: The outlier differs from all other normal values clearly.



- Contextual outlier: The outlier differs from all other normal values but within a specific situation. For example, 35 degrees Celsius in winter in Moscow (Russia) is not normal at all, but in summer it would be a perfectly possible temperature; so in winter it would be considered as a contextual outlier, while in summer it would be a common value.
- Collective outlier: In this case the outlier appears grouped with other outliers of similar value, and therefore can be camouflaged more easily, but its creation mechanisms are still different from those of the normal data and therefore the person in charge of performing this technique will need to have sufficient ability to detect them.
- According to the dimensionality:
  - Univariables: Outliers are detected in each independent variable, taking into account the data of each variable exclusively.
  - Multivariables: The outliers are detected jointly. For example, a pair of variables mark and attendance of student that is atypical, and although mark alone and attendance alone may not be atypical, the detection of the outlier is defined jointly by both variables, and not individually. For instance, a student with the highest mark and the lowest attendance is very strange.

With the above essential concepts in mind, it only remains to use the outlier detection algorithms, which could be classified as follows:

Table 1: Types of outlier detection algorithms

Type	Specific algorithms
According to statistical techniques	Boxplot, standard deviation, standard error
Depending on proximity	KNN (K-Nearest Neighbours)
Depending on density	DBSCAN (Density-Based Spatial Clustering of Applications with Noise)

Once the outliers are detected with any of the aforementioned techniques, we can apply three possible solutions:

10. Discard outliers directly, removing them from the dataset.
11. Change the value of the outlier to another value that is not considered an outlier, imputing the most extreme value possible without being considered as an outlier.
12. Delete the outliers and carry out some algorithm to impute empty values.

## Data transformation

Data transformation seeks to apply some mathematical function or operation to the original data to obtain new data that fulfils some new characteristic. Generally, machine learning algorithms require some transformation in the data that they are going to process, since if some initial conditions are not met, it is very likely that they will not learn correctly or their performance will be decayed.

We could highlight 4 main types of data transformation:

Table 2: Typical algorithms for detection of outliers

Type	Note
Obvious transformations by domain	It consists of keeping variables or data in a variable in the same unit or scale.
Normalization transformations	It consists of getting the same range of values in all the variables. For example: All variables having minimum value of 0 and maximum value of 1.
Standardization transformations	This type of transformation is extremely important, as the vast majority of machine learning algorithms do not work well if their variables have different ranges. It consists of homogenizing some property on all attributes of the dataset. For example: All variables having mean 0 and standard deviation 1.
Distribution transformations	It consists of transforming an original distribution into another more convenient distribution for machine learning, generally the normal distribution. For this type of transformation a function is used with the main requirement that it has an inverse.

All the aforementioned transformations are important, but the one that can give the most complications is the *distribution transformation*, since there are three issues to keep in mind (McDonald, 2014):

13. The transform function must be invertible in order to retrieve the original value, if needed. For example, the inverse of  $\log_2 x$  would be  $x^2$ .
14. Not all functions support any input value. For example the transformation with the function  $f(x) = \sqrt{x}$  does not admit negative values or zero, therefore it can only be used in variables with all their positive values, unless some previous transformation is carried out to the same variable that guarantees that all the values are positive, such as adding to all the values a constant that makes all values positive.
15. Transformations can be chained, but it transformations made should be justified to the scientific community.

Some of the most well-known transformation functions are:

Table 3: Most Commonly Used Distribution Transformation Functions

Type	Important formulas	Reverse formula	Comments
Logarithmic	$\log_{10} x, \log_e x$	$10^x, e^x$	Used in natural and biological behaviours
Square root	$\sqrt{x}$	$x^2$	Used for counting
Arcsine	$\arcsin(\sqrt{x})$	$\sin^2(x)$	Used for proportions

### **Dimensionality reduction**

Dimensionality reduction tries to decrease the number of variables required for machine learning, so that the time required for learning can be reduced, as well as computing resources optimized.

There are two approaches to reduce the dimensionality of a dataset:

- The first approach is based on selecting and removing attributes based on their importance level, but without changing the original values of the selected variables. Some simple techniques are:
  - Low variance: Variables with low variance are removed, as they barely provide information to the dataset.
  - High correlation: One of the two variables that are highly correlated is deleted, as the information they transmit is redundant.
- The second approach is based on constructing new variables from the original ones, so that an attempt is made to maximize the information from the first new variable to the last new variable, always reflecting as much information as possible in the first variables, so that fortunately, it takes far fewer new variables to provide nearly the same information as with all the original variables together.
  - PCA (Principal Component Analysis): It is the main algorithm of this approach, and one of the most used in any machine learning operation. As a concrete example, if we start with an original dataset containing 100 variables, the objective will be to construct 100 new variables formed from the 100 original variables but maximizing the information, so that with only the first 60 new variables, the 99% of the variation of the original dataset of 100 variables is included, and therefore, with these 60 new variables we can perform machine learning faster and with less computational costs than if we had to use the original 100 variables.

## Conclusions

Throughout this paper, the most important and widespread techniques that help filter, improve and optimize datasets have been developed and explained in a conceptual way, and therefore, many tools have been offered to improve machine learning on gamification datasets.

Finally, it is important to note that the order in which the techniques were explained is totally arbitrary, and the data scientist will be responsible for choosing the techniques to apply and in what order, by taking into account the characteristics of the educational dataset to be processed.

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## ONLINE PEER ASSESSMENT IN A FIRST CYCLE UNIVERSITY DEGREE – WHICH CHALLENGES?

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### Abstract

Authenticity and transparency constitute two essential dimensions in the digital assessment of competences. Authenticity emphasises the importance of the complexity inherent to online assessment tasks related to real life contexts and are recognised as relevant by students, teachers and potential employers. Transparency has to do with the students' involvement in the assessment tasks, through the democratisation and knowledge of the used strategies.

Self-, co- and peer assessment are powerful instruments in the transparency operationalisation.

The current study presents the peer assessment (PA) implementation process in a first cycle university degree curricular unit, in online context. The study was planned according to the following purposes: (a) to identify peer assessment potentialities and constraints in first cycle university degrees; (b) to analyse the questions that are brought forward among students by the application of a scoring rubric; (c) to reflect on the obtained results, aiming at the improvement of the implementation process and its applicability to other curricular units. In this essay, the authors present and discuss the obtained results, and propose recommendations to improve the quality of the peer assessment process.

**Keywords:** authenticity; peer assessment; scoring rubric; transparency.

### Introduction

In general, the student assessment in Higher Education has been carried out by teachers, and the students' role in the process has been small. However, as Dochy, Segers, and Sluijsmans (1999) state, peer assessment, defined “as a way whereby students assess the quality of their colleagues' performance and give feedback to one another”, assumes a growing importance within the process of continuous assessment. The disadvantages that are sometimes pointed out regarding peer assessment, according to

Panadero, Romero, & Stribjos (2013), are not intrinsic to Higher Education, due to the maturity and capability of young adults. Moreover, another argument is related to the fact that, in the world of work, each individual assesses both his/her own work and his/her peers'. Thus, it is of utmost importance that students can develop assessment competences (Boud, 2000; Boud & Falchikov, 2006).

Within the scope of the project “Avaliação Digital de Competências (@DiC)” / “Digital Assessment of Competences (@DiC)”, the authors have implemented diverse forms of assessment in Second and Third Cycle curricular units of different university courses, in online contexts, at Universidade Aberta de Portugal (UAb). This work, supported by research (Pereira et al., 2015), has led to relevant conclusions, namely and above all the influence that the students' different backgrounds plays in their views on PA and their involvement in this form of assessment, as well as the importance in establishing trust, both among themselves and between them and the teacher. The preliminary study here presented is within this line of research and was developed in a curricular unit of the First Cycle Degree in Humanities at UAb, according to the following purposes:

16. to identify potentialities and constraints in the use of peer assessment in first cycle university degrees;
17. to analyse the questions that are brought forward among students by the application of a scoring rubric;
18. to reflect on the obtained results, aiming at the improvement of the implementation process and its applicability to other curricular units.

This paper begins with the presentation of the essential concepts that sustain the empirical part of the study; then, it describes and justifies the methodological options; afterwards, it explains and analyses the obtained results. Its final part contains some reflections and consequent recommendations that involve theoretical concepts, as well as conclusions of previous studies.

## **Conceptual Framework**

In the digital assessment of competences two essential dimensions are authenticity and transparency, due to the following reasons: authenticity refers to the similitude degree among the competences to be assessed and the competences that are required in everyday and in professional life, where the type of assessment tasks is relevant; transparency is related with visibility and understandability, regarding everyone involved, the students, in particular. Therefore, it is important that students have the notion of justice while assessing, that they know and take part both in the definition of criteria and their scores. Peer assessment, such as self- and co-assessment, is part of the necessary strategy that aims at the transparency of digital assessment of competences. The online assessment facilitates

the students' communication with their peers, as well as the reflection and consequent improvement of their work, based on the peers' feedback (Pereira, Tinoca, & Oliveira, 2016).

PA is accomplished in authentic tasks "in which the desired evidence of learning is to have students demonstrate an ability to generate ideas or produce a product, such as answer open-ended questions, write an essay, submit a report, design an artifact, engineer a process, or solve an ill-defined complex problem" (Suen, 2014; p.316). Moreover, PA is understood as a process in which a student assesses another student's work, according to adequate and normalised criteria, devised to assess the quality of such work (Topping, 2013). This process "involves students in assessment, generates feedback that might be useful to the evaluated peer, and also gives the peer assessor insights as to how their own work might be improved" (Panadero & Brown, 2017; p. 134).

In a study on the use of PA in several Higher Education scientific areas, Lladó et al. (2014) conclude that students consider it positive, recognising not only its potential in the motivation and learning, but also its support in the reflection on their learning processes. There are, however, other aspects highlighted by the students, such as anxiety and discomfort, as a consequence of their peers' assessment. In the same line of thought, Panadero, Romero, and Stribjos (2016) emphasise the fact that sometimes the students do not accept the responsibility of assessing their peers, considering it unjust and revealing insecurity when their works are assessed by peers. These issues are particularly relevant when PA constitutes a part of the student's final assessment (Topping, 1998). It is therefore crucial that the scores assigned by the peers are reliable and not biased due to personal relationships. Several studies (Topping, 2003; Falchikov & Goldfinch, 2000; Suen, 2014) show that PA is reliable and valid, since it complies with adequate conditions.

An essential aspect that must be taken into account in the PA implementation is related with the establishment of scoring rubrics. Scoring rubrics use descriptive ranges that show the students what is relevant in the tasks and specify both the strong and the weak aspects of the work to be assessed. Scoring rubrics should be simple and clear, efficient while used, and should limit the tasks that each student has to accomplish (Suen, 2014). In the elaboration of a rubric one has to consider the validity (one has to check whether it measures what is supposed to be measured), the reliability (one has to check whether the results are consistent in time and through different peers) and the usability (Yuan & Recker, 2015).

Synthesising the above mentioned aspects, PA contributes to the development of competences, such as the ability to: criticise and to accept criticism; argue on one's own point of view; reject other suggestions whenever justified. Furthermore, PA promotes



learning self-regulation and personal responsibility, mainly when a good feedback is produced (Nicol, 2010); simultaneously, it increases self-confidence and confidence among peers.

## **Methodology**

This work is focused on the use of PA in the context of a First Cycle Degree online curricular unit at Universidade Aberta (UAb). According to the UAb Virtual Pedagogical Model, the first cycle degree students may choose the assessment modality: continuous assessment or final exam. Continuous assessment is based on works (2 or 3) that the students have to produce within the semester – e-folios – and on a final work at the end of the semester (should they obtain a minimum score in the e-folios, stipulated by the institution). At the beginning of each curricular unit, the students are informed of the competences to be developed, the programme, the methodology, the bibliographic materials and the assessment characteristics. All these elements are contained in an online document in the virtual space of the curricular unit, entitled Curricular Unit Plan.

The researchers decided to develop a pilot study in a 1st year curricular unit – Classical Studies II – of the Degree in Humanities, with the following purposes, in order to define strategies for the implementation of the process in other first cycle degree curricular units: the analysis of the continuous assessment students' receptivity regarding PA; the analysis of the questions that are brought forward among students by the application of rubrics.

Bearing in mind that it is a 1st year curricular unit, the researchers opted for the use of PA in general competences, transversal to the study area, having excluded the scientific contents field of the curricular unit; they also opted for the implementation of PA according to a formative perspective, on a voluntary basis, aiming at avoiding possible tensions inherent to a summative assessment. There were 2 e-folios, consisting in the elaboration of short essays on the subjects under study. According to the curricular unit assessment, 5 criteria were defined to support PA: (a) the accomplishment of the proposed task, bearing in mind the stipulated purposes; (b) the construction of argumentative speech; (c) the selection of data/bibliographic material, relevant to the task; (d) the application of citation rules, according to the recommended manual of style; (e) the organisation of the bibliographic materials, according to the recommended manual of style.

The operationalisation of these criteria gave origin to a rubric, and each criteria was thoroughly described, according to three levels: insufficient; good; very good. Specific information on PA was introduced in the Curricular Unit Plan, so as the students could be aware of the proposed assessment modality since the very beginning of the semester, namely on the transversal nature of the competences to be assessed and on the formative

aspect intrinsic to PA. A specific forum was also created at the beginning of the semester, so as the students could ask questions on PA and discuss its specificities with the teacher. In this forum, the teacher had also the opportunity to motivate the students regarding PA, emphasising its advantages, particularly in self-assessment and in the acquisition of competences. The Moodle Workshop was the technical tool chosen by the researchers to the PA process and was set up to anonymous/blind grading.

An online questionnaire to collect data was produced by the researchers and made available to the students at the end of the semester. It was constituted by 9 questions (7 close-ended, 3 open-ended). The questionnaire was anonymous and approved by the Ethics Commission of Laboratório de Educação a Distância e eLearning. The close-ended questions were on general demographic data, including: age; gender; previous experience in PA and in UAb; participation in the PA activities. Amidst the open-ended questions, one was related to the students' perception on the PA use and to future perspectives of PA use. This question was built in terms of statements, asking for agreement according to a five-point Likert scale: strongly agree; agree; neither agree nor disagree; disagree; strongly disagree. The statements for this question are presented in the section on the data analysis.

Two of the open-ended questions were intended for the students who participated in PA, asking them about the positive and negative aspects of the process. The third open-ended question was intended for the students who did not participate in PA, asking them to indicate the reasons for their option.

## **Data analysis and interpretation**

The curricular unit had 29 enrolled students. 23 of them had chosen continuous assessment. 15 students, predominantly women (10), responded to the questionnaire. Most of the students were age 40 or younger (4 were age 30 or younger); the other 2 were older than age 50. 11 students were attending the university for the first time, and only 1 student had already participated in PA activities. Among the 15 respondents, 7 indicated that they had participated in the PA process.

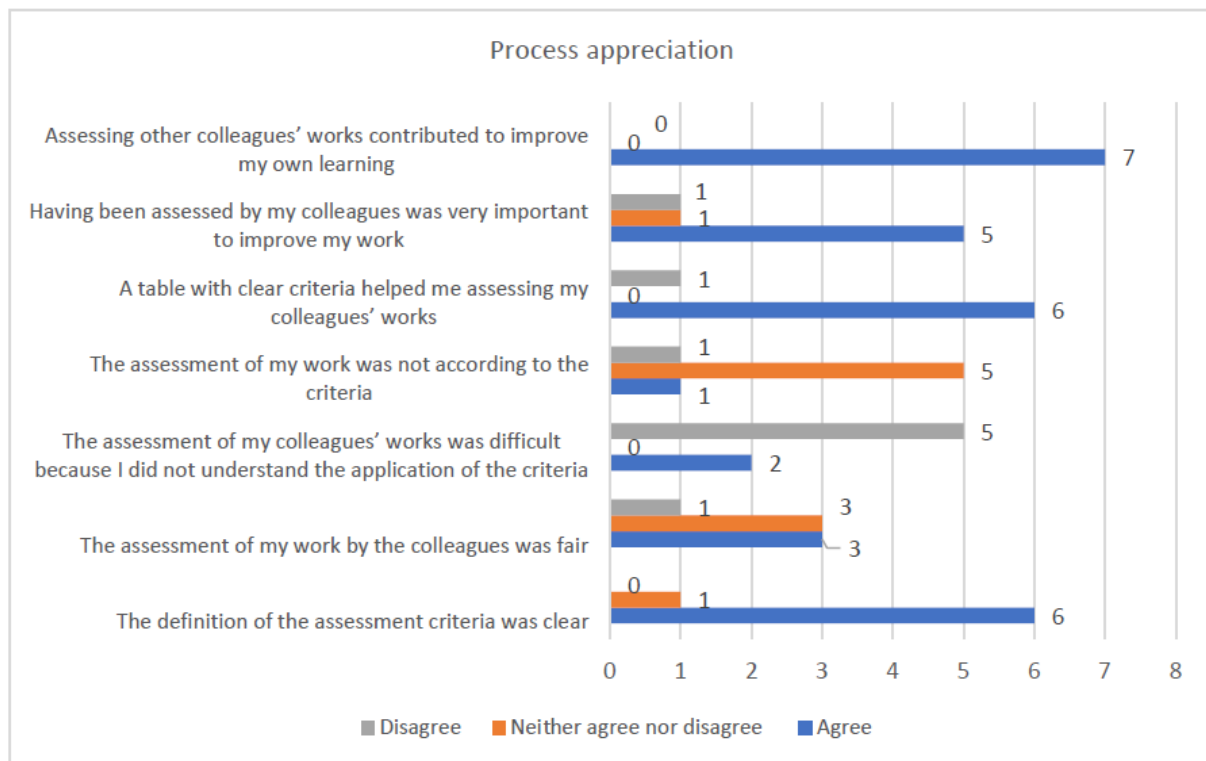


Figure 1. Students' perception on the PA participation

Due to the small number of respondents who indicated their participation in PA, we decided to group the Likert scale levels as follows: *agree, disagree, neither agree nor disagree*

As one can see, the importance of the PA process is unanimously pointed out by the students. The large majority of the respondents considers that a scoring rubric, with clear criteria, is relevant to the accomplishment of the PA process. However, the students' perception changes when they approach their colleagues' assessment. As a matter of fact, it seems that they do not entirely trust their peers, due to the lack of clear assumptions regarding the fairness of the assessment. On the other side, although the students understand that the criteria were clear and that they had no difficulty in the PA process, there is a contradiction here, once they do not assume that the assessment was not accomplished according to the criteria. From our point of view, this fact may reveal some kind of insecurity regarding their colleagues' assessment, reinforcing the lack of confidence in the peers.

As for the students' opinion regarding a future use of the PA process, Figure 2 synthesises the obtained answers.

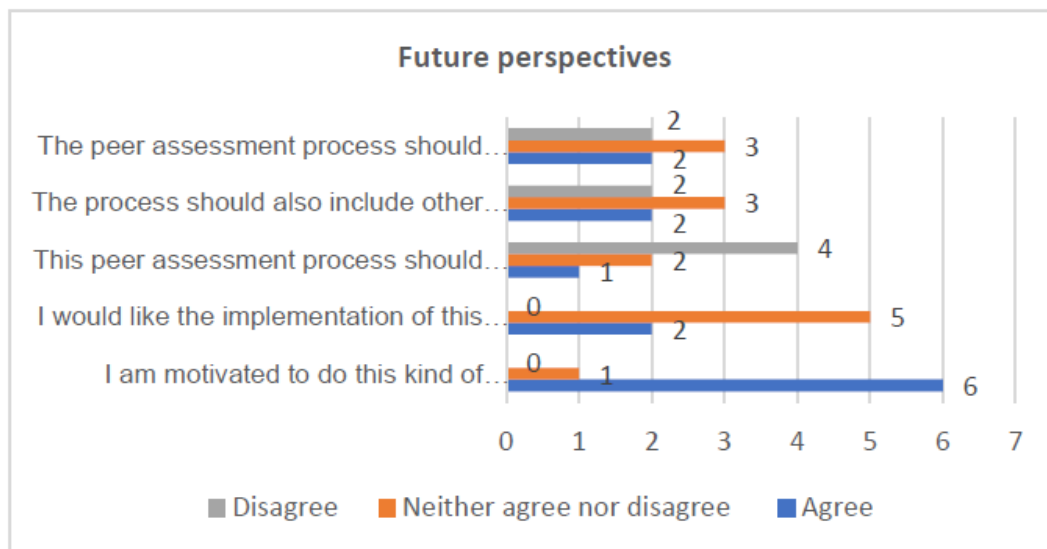


Figure 2. Students' opinion on the future use of the PA process

Although practically all the students considered that they would like to do PA more frequently, the responses show a great diversity regarding a possible wider range of contents, other competences or other curricular units. This seems, once again, to indicate insecurity throughout the process and some lack of confidence and confirms the analysis of the way the students dealt with the experience. Even though the formative use of PA is not called into question, this insecurity may justify a clear disagreement regarding the possibility of summative PA.

Some responses highlight a deep unfamiliarity with PA, as clearly exemplified by some of the statements. A student referred the need of research on the matter, despite the teacher's elucidations on the process – “Once it was the first time I dealt with PA, I felt the need of a thorough research on the process in the internet. Along with the information in the curricular unit, my individual research helped me a lot (student A1). Taking the negative aspects of the process into account, several students refer the fear of not being fair, while assessing – “The lack of time and the fear of being unfair” (student A3); they also refer the distrust of their colleagues' assessment – “I did not agree with the assessment of my first work” (student A2).

Nevertheless, the same students emphasise the positivity of the experience concerning the impact on their own learning, as the following statement shows: “This assessment process led me to improve my skills, namely in the fields of rigour and attentiveness, while elaborating my works” (student A1). Three other students also refer the possibility of knowing different perspectives, while another student adds the benefits of comparing one's work with the colleagues' – “I could see how my colleague wrote the work and I could compare it with mine, thus becoming aware of my interpretation and which was my level (student A4).

The reasons given by some students who did not wish to participate in the PA process have to be underlined. Among this three of them refer the lack of time for an extra activity and the fear of being unfair while assessing; two refer the fear of criticising their colleagues and of being unfair while assessing; one mentions the optionality of PA, another one the formative (and not summative) grading, and a student recognises the failure to understand the process.

The need of a thorough clarification was also mentioned at the beginning of the semester, in the PA forum. The teacher answered every question. While the process was being accomplished, some students asked for technical support regarding the Moodle Workshop, which was considered not entirely user-friendly by some of them.

## **Conclusions and final reflections**

The purpose of this work was a preliminary study regarding the PA application in first cycle university degrees, in online context, observing both the students' adherence and their constraints and difficulties. Taking the data above analysed into account, the students who participated in the PA process considered it important and are in favour of its future use. As we have mentioned, the availability of a scoring rubric helped the PA implementation.

However, the obtained data require some reflection. Despite all the initial information and the teacher's elucidations in the PA forum, a few students had eventually some doubts and were unsure of the process, regarding not only the application of the scoring rubric, but also the fairness inherent to their colleagues' assessment. This insecurity and lack of confidence is also patent in the assertive refusal of the PA process implementation in other competences or curricular units. The students who did not participate underlined both their fear of being unfair and the time issue. The latter may be directly connected with the UAb students' general profile: adults, who have to organise their time very carefully, and thoroughly articulate the learning activities with their personal and familiar ones.

We may assume that several students, when facing a situation which implies that assessment is not exclusively accomplished by the teacher, undervalue the possibility of participation or even consider that it is the teacher who should carry it entirely out.

This and the fact that only 8 out of the 23 students participated in the PA process highlights the importance of dedicating a longer period of discussion with the students, before the process is implemented, in order to approach not only the procedures, but also the scoring rubric. The worthiness of PA to the learning self-regulation has to be emphasised, so as the students' motivation to adhere to it may increase. In this context, one should consider the possibility of synchronous sessions with the students, to facilitate the debate on the matter,

through questions, comments and clarifications. Once that at the UAb the online context is essentially asynchronous, such an option may lead to a greater involvement on the part of the students, and may promote their trust, both among them and between them and the teacher.

Beyond these aspects, it is important that the PA process is implemented simultaneously with the students' self-assessment, because, with a common scoring rubric, the students will be able to compare their own assessment with their colleagues'. The implementation of the scoring rubric will be clearer when articulated with a mandatory qualitative feedback, thus promoting a deeper reflection on the accomplished assessment.

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## FORMATIVE ASSESSMENT A RESEARCH BASED ON A TEACHERS' TRAINING COURSE IN A BLEARNING ENVIRONMENT

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### Abstract

In this article we present a research project whose results are the outcome of a teachers' training course, for the practice of formative assessment, with the use of digital tools, applied to students from the third cycle, of basic education, to secondary education. Our key question, "How is formative assessment put into practice in the classroom of the teachers involved in our training workshop?", stemmed from the following core objectives: understanding if teachers integrate the technological dimension into the design of their students' assessment and perceiving the sort of digital tools they use to promote teaching and the regulation of the students' learning. The focus of our training course, developed as a workshop, was to understand how the teachers' practices had changed after attending the course. The study was developed as a qualitative and interpretive research and the teachers' training plan was elaborated in an action-research model. The collected data was triangulated from multiple sources in order to capture the complex and multi-faceted aspects of the pedagogical work. The results offered evidence of the potentialities and constraints of the students' formative assessment, grounded on digital learning platforms, and the ways teachers incorporate certain digital tools into their practices.

**Keywords:** Formative assessment; Digital assessment; Teacher training;

### Introduction

In the current study we wanted to characterize the teachers' assessment practices in the classroom and intervene in their pedagogical exercise so as to bring about an enhancement. Having this purpose in mind we developed an in service teacher training plan, using a blended learning model, which combined digital contexts with a conceptual matrix and framework for the assessment of competences.

The research was developed in an action-research methodology as a qualitative and interpretive approach. We established the following objectives: (a) understanding if the



students' assessment is intentionally and unequivocally formative; (b) clarifying whether the participant teachers of the third cycle and secondary education include online tools when the students' assessment, and learning, is designed and executed; and (c) identifying which are the most common digital tools used in the students' learning and assessment processes. In the action-research technique we aimed at leading the participants into a deep reflection about their pedagogical performance, and guiding their teaching processes into an active incorporation of formative assessment in a digital environment. During the teachers' training sessions we intentionally carried out improvement strategies for the incorporation of digital tools on formative assessment procedures.

This paper is focused in presenting the blended learning and training plan design in which collaborative social constructivist practices were adopted.

### **What is a Digital Formative Assessment?**

Formative assessment, which is digital, occurs in a domain that is not geographically located, using the dynamics of collaborative work and digital technologies online. It is practiced in a virtual learning environment, integrates the references of non-digital formative assessment, and is mediated pedagogically by the teacher, in a multidirectional cooperative structure in which students are proactive actors, interacting with each other and with the teacher. This means, according to Pereira, Oliveira, Tinoca, Pinto, and Amante (2015; p.11) that it should be an assessment for learning, through the adoption of an approach in which the student is seen as an active participant, who shares responsibility for the learning process, practices self-assessment and reflection, and collaborates with the teacher and with the other students.

The activities undertaken by teachers, and / or by students, in a formative assessment, whether being digital or without the use of online platforms, provide information, that should be used to give feedback, in order to orient the teaching and learning activities involving the students. Emphasizing this principle, of a *feedback* which has to be considered a *feedforward*, we have selected the following description that seems to clearly define the way we understand it:

*“An assessment functions formatively to the extent that evidence about student achievement is elicited, interpreted, and used by teachers, learners, or their peers to make decisions about the next steps in instruction that are likely to be better, or better founded, than the decisions they would have made in the absence of that evidence” (William, 2011; p.43).*

To make the learners recognize the added value of digital formative assessment, as a needed strategy which can develop their intellectual capacities and cognitive processes –

targeted through the analysis, planning and implementation of the necessary actions to obtain success (Salema & Cardoso, 2015) – it is essential that the design of this assessment fits into some quality standards, is mediated by technologies, and built around four main dimensions: authenticity, consistency, transparency and practicality (Pereira, Oliveira, Tinoca, Pinto, & Amante, 2015). These dimensions are, to some degree, an assurance that the online assessment tasks are complex, related to a real life context, and recognized as significant by students, teachers and all the involved in the process (Figure 1).

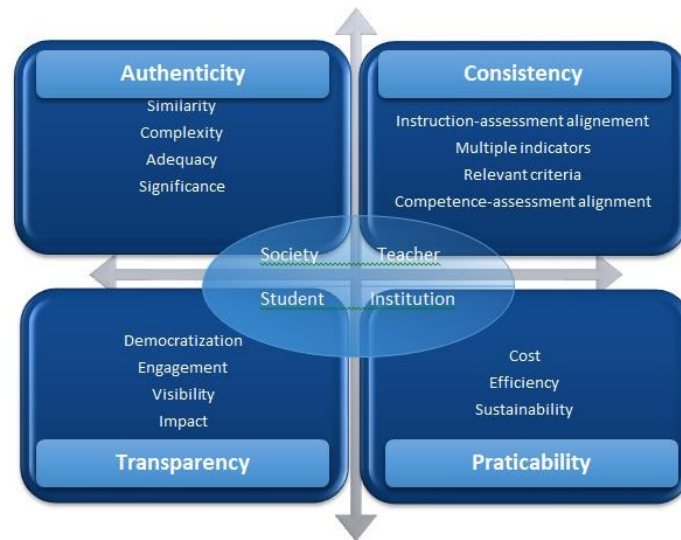


Figure 1. Framework for the assessment of competences in digital assessment (Pereira, Oliveira, Tinoca, Pinto, & Amante, 2015)

Even if this conceptual matrix was originally developed for e-assessment in Higher Education, it was applied as a framework, in our research, in the in service training course. A more complete and detailed description of the dimensions, and their reference criteria, should be looked up at Pereira, Oliveira, Tinoca, Pinto, and Amante (2015). The following description is a summary:

- *Authenticity* – is related to the degree of similarity between the competences being assessed and the ones required in real life. In this dimension four reference criteria, contributing to the degree of assessment authenticity, are included: Similarity, Complexity, Adequacy, and Significance.
- *Consistency* – it has the teacher as a main referent and requires the alignment of the competences, under assessment, with the instructional tasks, assigned to the students, the strategies, used in the teaching process, and the assessment criteria, which should have varying indicators. The dimension is constituted by four criteria: Instruction-assessment alignment, Multiplicity of indicators, Relevant criteria and Competences-assessment alignment.
- *Transparency* – it presents the student as a referent and points out to the need for digital assessment to be perceived as fair, by all the involved. Therefore, it requires

full knowledge of the criteria and their relative weights. For this dimension, four criteria were contemplated: Democratization, Engagement, Visibility, and Impact.

- *Praticability* – it is related with the feasibility of the assessment strategy and has the school as a referent. It implies an effective management, and balance, between time and cost/efficiency. If practicability is guaranteed the students consider the assessment strategies as being relevant, doable, and a real contribution to their learning. It is comprised of three criteria: Costs, Efficiency and Sustainability.

## **The relevance of teacher training in a bLearning model for the practice of digital assessment**

If trainee teachers are asked to understand the importance of the inclusion of a formative assessment into their classrooms, incorporating strategies hosted by digital environments which are not exclusively psychometric, they have to be guided into the performance of experiences which are transferable to their real practice. Additionally, their performance should be made consistent and in balance taking into consideration the purposes of the curriculum, the teaching and the assessment (Fernandes, 2008; p.78). This means the training circumstances ought to resemble learning contexts, similar to a didactic intervention with students.

When teacher training sessions juxtapose practices, which the teachers can replicate with their students, they are better recognized as enriching training environments where the answers, to their greatest difficulties, are found, especially because the adoption of an active *blended learning* paradigm is not yet totally established in the classrooms routines. In a formative model of this nature, the combination of different technologies and learning configurations include sequences of synchronous and asynchronous work, facilitated by digital web tools, among other conventional means of training support. The trainer, in the role of a facilitator, selects the strategies that best suit the trainees' personal characteristics and digital literacy level. As a coach, establishes a favourable relationship, handling the moments something has to be said, and theoretical arguments have to be presented, with those in which he must be a dynamic listener. Now and then he demonstrates, and, in other moments, the trainees reproduce or create. The trainer must keep questioning the processes and deciding what is more appropriate for the participants. An in service training course has to be meaningful, pertinent, contribute to the reconstruction of the knowledge already acquired and take advantage of the trainees' previous experiences, stimulating the research of problems on the teachers own practice (Rocha, 2013; p.197).

It's unavoidable that teachers acquire updated digital skills. Many teachers are still afraid of using educational software and strife with online pedagogy. In covid-19 times, of distance learning emergency plans, the classrooms had to be brought into a virtual space

and these unfamiliar circumstances have posed new challenges, particularly, with communication technologies and online platforms, treading the path to develop the learners' competences. The current urgency for the development of digital and technological skills, and online expertise, is making distance education, in training courses, more and more relevant. New training opportunities should provide collaborative spaces to promote knowledge and critical reflection, in order to help teachers build new bridges so that their comfort zone becomes familiar again and is re-established. In a sense, we agree with Dewey (1988; p.134) "to learn from experience is to make a backward and forward connection [...] doing becomes a trying; an experiment with the world to find out what it is like". We now have a more fertile field than before, when, in the classroom, traditional teaching models were practiced. More dynamic and innovative training environments may contribute to more motivating teaching practices.

Consequently, it seems essential that the training sessions offer experiences and learning perspectives to think, analyse, evaluate, as well as, opportunities to create and for individual development and professional enhancement, by means of a collective support.

## **Methodology**

We took a qualitative approach, using a variety of information sources, combining quantitative and qualitative methods, through the application of two surveys, participant observation, field notes (collected during the training sessions) and narratives (included in digital portfolios – in this paper we'll be fixated in the results of the surveys as it won't be possible to mention the data collected from the other sources). We considered that it is advantageous to collect quantitative and qualitative data, taking Flick (2004) as a reference, as it allows the convergence of interpretations, mutual confirmation and support for the conclusions. On the other hand, the triangulation of all data establishes the guarantee of internal validity, being relevant in the context of a good qualitative study, as pointed out by Yin (1994) or Stake (1995).

The surveys had the specific intention of obtaining the participants' know-how in formative assessment and if their practices had changed (or not), in the outcome of the course, in comparison with the entry point. They had similarities, were made on a Likert scale, containing three open questions, and were applied in the pre-initial and post-final moment of the training. The pre-survey, of an exploratory nature, made it possible to identify the pattern, most commonly adopted by teachers, in the students' formative assessment. We also perceived whether their formative assessment choices were intentionally and unequivocally formative, included a technological design and which digital tools the participant teachers were already familiarised with. The follow-up survey aimed at ascertaining the degree of understanding of the participants about a real

formative assessment; whether they had evolved in their comprehension of the theoretical grounds; and if they had acquired a more assertive position on the positive evidences of using digital tools in a blearning pedagogy. The preliminary results offered evidence of their practices of an incipient nature, including formative assessment with a low expression in the didactics and revealing many similarities with a summative assessment.

In the training sessions we stimulated group work, by departmental affinities, and continuous interaction between the trainees-trainers and trainees-trainees. It was made clear that these affinities facilitated the convergence of interests and the development of common tasks with main purposes.

Figure 2 is an illustration of the sequential structure of the workshop, demonstrating how the face-to-face sessions were coordinated with the non-face-to-face moments, according to a pedagogical architecture that stimulated the learning pursuit.

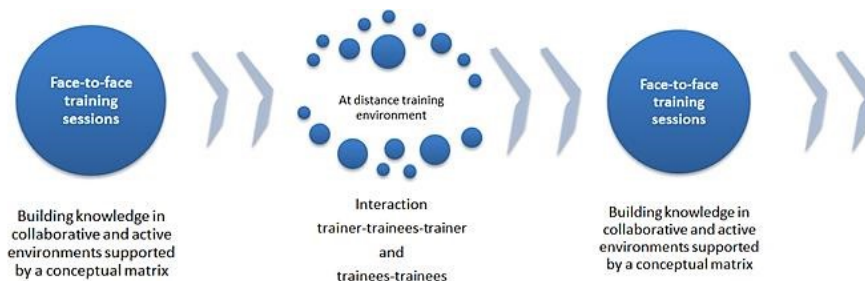


Figure 2. Blearning Training design

The contents of the action were distributed according to the following plan:

19. Formative assessment and learning a. The diagnosis of training needs.

- Theoretical foundation:
  - Clarification of concepts
  - Framework for a formative assessment
- Presentation of the training tasks with the Moodle support

20. Practical activities for building assessment instruments and tools in a digital environment

- Adaptive preliminary elearning activities for the training work model
- Activities related with the digital assessment theoretical framework
- Design of the formative assessment instruments for application in the classroom
- Peer assessment strategies.

21. Follow up activities

- Assessment of the learning carried out in the context of the workshop.

- Sharing experiences.
- Workshop assessment.

During the workshop tasks, we incorporated frequent feedback dynamics, as well as the dimensions and criteria which had to be considered in the design of the digital formative assessment (authenticity, consistency, transparency and practicality). Similarly, we requested that the activities, developed by the trainees in the execution of the students' formative assessment, included them.

The thirteen participants, nine female and four male teachers, teaching in the 3<sup>rd</sup> cycle and in secondary level classrooms, had diverse disciplinary contexts (Arts, Biology and Geology, English, Sciences, Geography, Economics and ICT). They were aged between 41 and 55 years old and each one was teaching a diversity of classrooms. They chose one or two classrooms to be the target of their improvement intervention in the context of the training workshop. The number of students which were reached and involved in these teachers' in service training strategies, mounted to a total of 364.

The face-to-face sessions favoured the gradual adaptation to the tasks in a digital environment considering that the trainees manifested having different skills in the use of technologies, and demonstrated unlike familiarity levels with distance learning or teaching.

## **Results**

The training workshop, which we designed to be the case of the study, was planned in order to provide the participants with a diversity of experiences, digital tools and practical activities, for building assessment mechanisms in an online environment. The practical autonomous work, consisting of the conception of formative assessment instruments, to apply in the classroom, had to be designed in line with the digital assessment framework. These initiatives made it possible to understand the constraints and potential aspects of using assessment for learning, based on the suggested digital platforms. After their effective use with the students, associating innovative opportunities for online collaboration, promoting self-assessment and hetero-assessment and performing feedback initiatives, the participant teachers had the opportunity to reflect in groups and offer their points of view on the benefits of the learning which was acquired.

Confronting the collected data in the two surveys, pre and follow-up, the impact of our training initiatives were made clear, as they resulted in interesting indicators about the intention of proceeding on with a blearning pedagogical method for the formative assessment of the students.

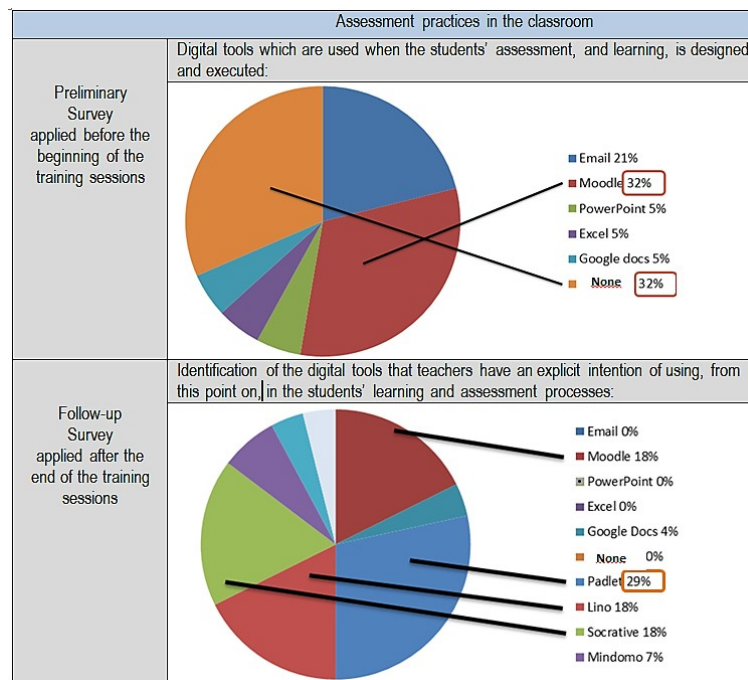


Figure 3. Digital tools in formative assessment and feedback strategies

In Figure 3 it can be observed how teachers recognized the potential of integrating the technological dimension in assessment situations. In addition to being more captivating for students, a digital learning environment promotes a greater intervention and awareness of the student in the assessment process and, consequently, in their school trajectory. After having attended the training workshop, the participant teachers seem to reveal a renewed intention to regulate the students' learning, by means of dynamic and interactive digital environments.

## Conclusion

At the beginning of the study, and before the training sessions had started, we collected data on practices that incorporated, in an insignificant way, the use of wikis for collaborative work, and, apparently, in a more intentional way, the Moodle platform, or Google docs. The Email, PowerPoint, Excel, or a class blog, were also pointed out as digital tools which were being used in the regulation of learning and in the elaboration of feedback. However, we found out that this practice, although framed in an intention of formative assessment, did not include individualized and descriptive elements and was centred on sending materials or disseminating results to the class group. These digital tools were, therefore, used for sharing or depositing materials. It seemed that digital environments were carried out, occasionally, without truly integrating the teaching and learning process. It was an incipient or embryonic technological use.

The training plan, that we implemented, intentionally guided and capacitated teachers to start designing teaching and learning processes, which include a technological dimension.

Our aim was also the promotion of higher-level cognitive processes during the performance of tasks. At the end the respondents clearly indicated having benefited from the provided hands-on course, as they were able to improve the characteristics of their pedagogical methods.

Web technologies may assist and promote innovative models of formative assessment and can foster the students' critical sense and initiative. In contexts of a digital nature it is possible to generate a cooperative and collaborative learning, projecting the teacher to the role of a guide and advisor in the student's autonomy. Pedagogical differentiation and inclusion, resulting from blearning educational structures which are adjusted to the student's profile, favour the flourishing of students. They also lead them into the development of 21<sup>st</sup> century skills, as pointed out in the report by Schleicher (2012).

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## STUDENTS' PERCEPTION ON E-PROCTORING SYSTEM FOR ONLINE ASSESSMENT

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### Abstract

Online exams organization increased during the Covid-2019 pandemic. E-proctoring tools represented one of the systems used to take tests and monitor students' behaviour and integrity. Previous studies on the theme analysed the ease, technical issues and reliability of the system, students' academic results and digital skills in using online tools, effect of proctored testing on anxiety and performances.

The paper presents the results of the questionnaire administered to 541 students at University of Modena and Reggio Emilia to define how the use of e-proctoring systems for exams affects students' perceptions about their performances and teachers' role and impacts on concentration, attention, time management, anxiety, understanding, and motivation. The sample was predominantly divided into two equivalent groups in the answers: students who found positive elements in the experience, and students who saw the anxiety worsening using Smowl; students who were ready to use this tool with or without teachers also in the future, and students who found worrying the distance from the teacher. The exception to these results is students in Digital Education course degree who demonstrate greater confidence in proctored testing.

The inquiry underlines teachers' necessity to accurately design the exams and communicate with students in all teaching moments (include assessment).

**Keywords:** e-proctoring, e-assessment, Online Assessment, Exams, Teachers' and Learners' Roles, Students' Perceptions

### Introduction

In the international context, the researches on online (formative or summative) assessment focused on various aspects: analysis of different online tools (ease, technical issues, and so on); types of tests used; validity and perceived reliability by institutions, teachers and

learners (Walker & Handley, 2016; Hillier et al., 2018; Costello et al., 2018, Janssen et al., 2019). Further studies compared paper with screen-based tests (Ranieri & Nardi, 2018), and analysed students' academic results and digital skills in using online tools (Ilgaz & Adanır, 2019).

Italian university rules (as in other countries and institutions) foresee the student's physical presence in the classroom for the carrying out of exams [see Decree n. 6 issued in 2019 by the Italian Ministry of Education, University and Research] and so, as a consequence, the organization and investigation on online exams and use of e-proctoring systems have limited till now.

Covid-19 lockdown pushed teaching and learning activities from traditional classrooms to digital environments. During the period of emergency, teachers and students developed their confidence with online learning tools and left out doubts and uncertainties in order to proceed with university training. In that situation, every training moment has changed: didactic with the teacher, self-learning, exams, in addition to the study environment itself. The whole academic community has continued and worked online (Minerva, 2020).

During the lockdown period and over, University of Modena and Reggio Emilia, who already had a long-time experience of blended courses based on Moodle LMS, adopted new and specific guidelines about assessment. Aware that, as a didactic moment, the assessment requires a particular reflection on methods, tools and environments, the attention was given principally to care and respect of students' status during the tests. Teachers focused on the identification of the candidate, the confidentiality of the student's data (GDPR 679/2016 and Italian Legislative Decree 196/2003), the public form of examination sessions, the quality and fairness of the test. *Oral* exams were held simply using one of the videoconference tools already available for streaming lessons. Thanks to the federated organisation of the university in departments, each one could organize the *written* exams depending on disciplines, tests, and costs of the digital tools chosen. Three were the possible solutions proposed by central governance:

- Live proctoring – small groups of students held exams in videoconference sessions with the presence of one or more teachers. The test can be a questionnaire on Moodle (platform called “Dolly”, as a personalization form) or another type of assignment (e.g. production of software codes or paper exercises/texts);
- Live proctoring with SEB – as in the previous solution, students participated in exams while connected in a videoconference environment. In this case, the exams were questionnaires with open/close-ended answers made on Moodle and controlled through Safe Exam Browser. This well-known browser can manage access to the device functions and other pages or applications;

- E-proctoring – students autonomously completed exams on Moodle while the e-proctoring system automatically revealed students' behaviour and integrity by checking desktop and webcam for the entire length of the test. Students registered to the system to verify their identity in the days before exams, checked their devices according to technical suggestions, downloaded the proctoring software, and completed their tests alone at home. Teachers prepared the exams well in advance, booked the proctoring system's use, sent students information and passwords to access exams on Moodle. In this solution, teachers were not engaged during the exam (their presence was not necessary) but at the end when they had to check the images and reports saved by the system from the webcam and desktop.

Carina S. González-González and colleagues (2020) define an e-proctoring system as “system formed by electronic tools that allows the monitoring of the remote evaluative process through telematic resources, trying to make the results reliable” (p.2). According to the authors, trust that is “the degree of security and privacy that users of a new technological tool expect to have when using it” (p.5) is the most decisive element in the implementation of such a tool for assessment in an institution. Studies about the virtual system, used to prevent plagiarism and cheating (Reisenwitz, 2020), regard the impact of proctored testing on anxiety, performances and learning styles (Wellman, 2005; Kolski & Weible, 2018).

In order to examine the students' experience at University of Modena and Reggio Emilia, a questionnaire on the e-proctoring system was administered. The results are discussed in the next pages.

## **Methods**

The aim of this research is to define how the use of e-proctoring systems for exams affects students' perceptions about their performances and teachers' role. Besides, the study points out what the opinions of students on the reliability of the tool are.

We administered a (not mandatory) questionnaire to students after completing their exams using the proctoring system called Smowl. The questionnaire is composed of 14 close-ended questions and two open-ended for the comments. Three questions regard the age, previous degree, and working status. The following 11 items on a 4 levels scale (1 – *Completely disagree*; 2 – *More disagree than agree*; 3 – *More agree than disagree*; 4 – *Completely agree*) focus on perceived performance, teachers' relationship, reliability of the tool, impact of the proctoring system on concentration, attention, time management, anxiety, understanding, and motivation.

After collecting the first results, we added two questions to clarify the results obtained until that moment. These two questions were proposed to students that chose the lower options

in the scale (1 or 2) to describe their performance using Smowl and the impact of the proctoring system on anxiety and concentration.

## **Results**

732 students replied to the survey, and we considered 541 observations for the analysis removing N/A from the original dataset. Among these, 194 observations include the two additional questions.

The survey participants belonged to 31 courses of the degree in Medicine (N = 302), Psychology (N = 117), Digital Education (N = 75), Informatics (N = 35), Biotechnology (N = 10), and Education (N = 2). During the Coronavirus pandemic, all these courses were delivered online. In normal conditions, the courses in Psychology, Education, and Digital Education are blended degrees, the others as traditional (face-to-face lectures). Smowl was used for final tests in all courses, except for the degree in Digital Education (DE), where it was used for preliminary tests on numeracy skills also before Covid-19 lockdown.

The sample was mainly made of students between 20 and 24 years old (74.7%). Only 10.7% of respondents had a previous degree, 27.0% were currently working. The number of workers was lower among students enrolled in traditional courses (17.9%), higher in the degree course in DE (62.7%). This last value probably deals with the age of the students enrolled in DE degree: 45.3% were between 20 and 24, 37.4% between 35 and 55.

Table 1 shows the answers to the questions related to students' perceptions of their performance during exams. 68.1% of the respondents declared that their performance was not better when using the e-proctoring system. We asked a lower percentage of students if their performance went worse or was the same compared to those of the face-to-face exams: 46.5% confirmed that their performance was worse, 53.5% that their performance was the same.

The sample was divided into two groups of equivalent dimensions on the items related to the positive/negative impact of the proctoring system on attention, understanding, and motivation (Table 2). The percentage of students who thought that the e-proctoring system's use negatively influenced their levels of anxiety and concentration during the exam is higher than 50% (57.0% anxiety, 54.9% concentration). On the contrary, 57.1% of the respondents assumed that this system improved time management during the test. For this question, we also asked for clarification of a sub-sample that chose options 1 or 2 as a reply in the previous query. Two-thirds of the respondents had a negative effect on levels of concentration, attention, time management, anxiety, understanding, and motivation.

In the open-ended question, the students declared that this way of taking the examination causes anxiety because, during the test, it is necessary to be careful of the technical and

**Students' Perception on E-Proctoring System for Online Assessment**

practical issues: internet connection, control of movements (eyes and whole-body), lighting, management of the devices. They were worried that they would fail because of a technical malfunction and not because of their performance.

If we consider the sub-sample of the DE students, the above percentages change. 66.7% of students chose options 3 and 4 in the question related to their perceived performance level. A percentage of students between 65% and 80% believe that using e-proctoring tools positively affects their attention, anxiety, understanding (and so on) during examinations.

Table 1: "My exam performance with the e-proctoring system was better than the one I would obtain in the face-to-face assessment".

Options	Total (%)	Degree in Digital Education (%)
1 – Completely disagree	24.8	12.0
2 – More disagree than agree	43.3	21.3
3 – More agree than disagree	26.2	52.0
4 – Completely agree	5.7	14.7

Table 2: "The e-proctoring system use in the test positively impacted concentration, attention, time management, anxiety, understanding, and motivation during the exam".

Options	Concentration (%)		Attention (%)		Time management (%)		Anxiety (%)		Understanding (%)		Motivation (%)	
	TOT	DE	TOT	DE	TOT	DE	TOT	DE	TOT	DE	TOT	DE
1	25.1	12.0	19.0	9.3	17.0	6.7	34.8	9.3	15.7	6.7	17.9	8.0
2	29.8	17.3	30.3	17.3	25.9	13.3	22.2	20.0	31.8	17.3	32.0	26.7
3	32.7	44.0	37.2	48.0	39.7	46.7	22.6	30.7	39.0	49.3	36.8	41.3
4	12.4	26.7	13.5	25.3	17.4	33.3	20.5	40.0	13.5	26.7	13.3	24.0

62% of the students agreed to use Smowl for exams in other courses and said that online assessment using tools like this is as reliable as traditional face-to-face exams. Students appreciated using the e-proctoring tool to reduce the physical distance and the time to reach the university. The online assessment resulted in a useful reply to the students-workers' needs.

In questions related to the teachers' relationship, 55.0% of students affirmed that the teachers or tutors' absence during the online test is not critical. However, only 42.9% thought that online assessment didn't increase the distance between students and teachers. In the open-ended question, the students often indicated that speaking with the teachers during the test can help ask clarifying questions about the exam texts. The same students recognized that this presence is less necessary when the exam's rules, goals, and text are clear from the beginning.

The answers by Digital Education students for these last two topics differ from the total sample. 82.7% agreed to use Smowl for other exams, 76.0% believed the tool is reliable,

70.6% were not worried by the absence of the teachers during the exam, and 61.4% didn't see the proctoring system as a tool that increased the distance between teacher and students.

## **Discussions and conclusions**

During the pandemic, in our universities teachers and students discovered distance learning and were "obliged" to experiment online solutions for teaching activities and also for exams. Their daily activities changed and a set of tools for recording, streaming lessons, online communication and assessment appeared in their lives.

E-proctoring with Smowl seemed a good choice not to stop training and manage exams of a large number of students in this emergency period. We experimented with this tool carrying out very different tests for score of difficulty, discipline, type, and year. In our university and our e-Learning centre, this operation required the establishment of a specific support and training team for teachers and students on Smowl and the quiz creation on Moodle.

We administered a questionnaire to students to collect their opinions and perceptions in the use of the e-proctoring tools and investigate the weaknesses, opportunities, and challenges of the online assessment.

The sample was predominantly divided into two equivalent groups in the answers: students who found positive elements in the experience, and students who saw the anxiety worsening using Smowl; students who were ready to use this tool with or without teachers also in the future, and students who found worrying the distance from the teacher. Some of them exposed the difficulties of applying this new technological approach and this new communication style with teachers. Others underlined the advantages in time management both during the exams and in reaching the university place.

After these results, we are interested to know what the students using live proctoring (see Introduction) could reply to these questions, considering that during exams in live proctoring students and teachers share the same videoconference environment just like in a classroom.

We questioned ourselves on how much the habit and digital skills in the use of a digital tool influence students' perception of their performance. The satisfaction percentages on the proctored system are higher in students' subsample in Digital Education (DE). Their opinions were very useful in comparing results between two different ways of using e-proctoring. Mainly final exams in the courses involved in this research were taken through Smowl. In DE degree, students used Smowl for preliminary tests to pass before the beginning of the second course year. They have the possibility to repeat the test once a

month during the first year and begin using Smowl before Covid-19 pandemic. A higher number of adults is enrolled in the degree course that, moreover, is delivered two-thirds online. DE graduates are instructional designers and experts in the use of digital technologies in education and training. Even though they are freshmen, these students may be more aware of digital educational tools, and we can assume that the greater confidence in the e-proctoring mode may also depend on this.

The inquiry underlines the necessity for teachers to accurately design the exams and the communication with students in all teaching moments (include assessment): the choice of types and moments of assessment has to be strictly linked to the learning outcomes and includes soft and professional skills (García-Peñalv et al., 2020).

Once the emergency phase is over, the effort in teaching during the Covid-19 pandemic will make sense if the whole institution will benefit from good practices on distance learning, studies on the online assessment, and creative solutions against daily challenges.

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## SHAPING THE NEXT NORMAL – EXPLORATIVE EXPERT SURVEY AMONG TEACHERS

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### Abstract

The Covid 19 pandemic has fundamentally changed the importance of digital HEI teaching. The digitisation of a course of study poses many challenges for teachers. This paper presents the results of a survey of lecturers at the DHBW (Baden-Wuerttemberg Cooperative State University). Challenges and opportunities were examined in order to derive recommendations for good digital teaching for the future. This paper is based on three pillars: (a) recommendations for good online teaching, (b) a list of the institutional support requirements, and (c) a foresight on the future of digital teaching.

In summary, it can be seen that teaching concepts have changed fundamentally as a result of the Covid-19 pandemic. While some courses have been converted to online frontal teaching, other formats promote the self-learning process of students by emphasising self-study, with teachers moving away from the classic role of knowledge mediators and increasingly acting as coaches. This can be seen as an effort to make the best possible use of the new conditions created by the pandemic in order to move higher education teaching from pure knowledge transfer to competence transfer.

The aim of the present analysis is to promote the digitization of courses in the long term and to make lasting improvements. The results should help teachers to design their courses efficiently and in a way that is appropriate for the target group and to improve the quality of teaching in the long term.

**Keywords:** Future Higher Education, Online Teaching, Survey, Digitization, Visions, Recommendations

## **Introduction**

Times of crisis pose great challenges for higher education institutions. The interruption of all on-campus teaching due to the corona pandemic during the summer semester 2020 has revealed the dynamics of how educational processes are already and will be organised in the future. The present paper aims to identify approaches and parameters for organising the upcoming winter semester and beyond and for successfully shaping the new normality.

Digitisation of (higher education) teaching has been significantly accelerated by the crisis. Still at the beginning of the year, it was broadly discussed as an important challenge to be met in the future, since digital teaching formats offer numerous potentials for higher education teaching. Flexibilisation, individualisation and quality enhancement processes at all levels of higher education can be promoted by new technologies. In other words, what has been considered to be a prospect that requires numerous barriers to be overcome, was largely implemented across the whole HEI sector within a few days: the transformation of the entire analogous teaching to online teaching formats was carried out spontaneously and without any possibility to preparing or training online methods and techniques. Now that online teaching is no longer just an option, it has become the necessary cultural technique to maintain teaching operations. According to experience reports, this transition appears to have been quite successful so far and, overall, positive (<https://hochschulforumdigitalisierung.de/de/blog/retrospektive-digitalsemester-communitystatements>).

This paper presents the results of an exploratory expert survey among teachers at the Baden-Wuerttemberg Cooperative State University. In this special situation of lack of knowledge and insecurity regarding the field of online teaching, the study explores whether and how the existing concepts of online teaching are experienced and provides first indications on which of those will play a special role for the future of online teaching. The paper presents the results on the basis of three components: first, recommendations for good online teaching are presented, which were derived from the interviews. Next, the support needs and contextual conditions are explained. Finally, the visions for a digital future in higher education teaching are presented.

## **Research Methodology**

In order to generate knowledge about particularly sustainable future concepts for the design of online teaching, starting from this special situation, in which a complete transformation of the entire teaching organisation from onsite to online teaching had to take place, an empirical-qualitative exploration was carried out based on a query of teachers at the Baden-Württemberg Cooperative State University who have proven extensive and successful expertise in this teaching form and its integration into the HEI.

### Shaping the Next Normal – Explorative Expert Survey among Teachers

For the identification and selection of this highly selective sample, an expert-based proposal method was chosen, supported by a cross-faculty support service that assists teachers in the conception and implementation of innovative, digitally enhanced teaching formats. Due to the explorative research design, in addition to the proven expertise, the aim was to achieve maximum differentiation in terms of subject areas. The principle of diversity enables a broad range of explanatory power of the theoretical reconstruction (Ehlers, 2011). A total of eleven interviews have been realised. The covered disciplines were Industrial Engineering, Civil Engineering, Business Informatics, Education Management, Entrepreneurship, Business Studies, Media and Communication Management, Education, Social Services, Auditing and Accounting.

In order to obtain qualitative data, semi-structured guideline-based in-depth interviews involving cover sheets have been conducted. The open design allows for exploration and in-depth analysis at points where the respondents' narrative structure suggests so (Mayring, 1997; 2002).

The expert survey was based on a multi-dimensional interview guideline, which was discursively validated in several rounds. To ensure the comparability of the results, the interview guide is based on three dimensions: (a) time dimension, (b) teaching dimension and (c) thematic dimension.

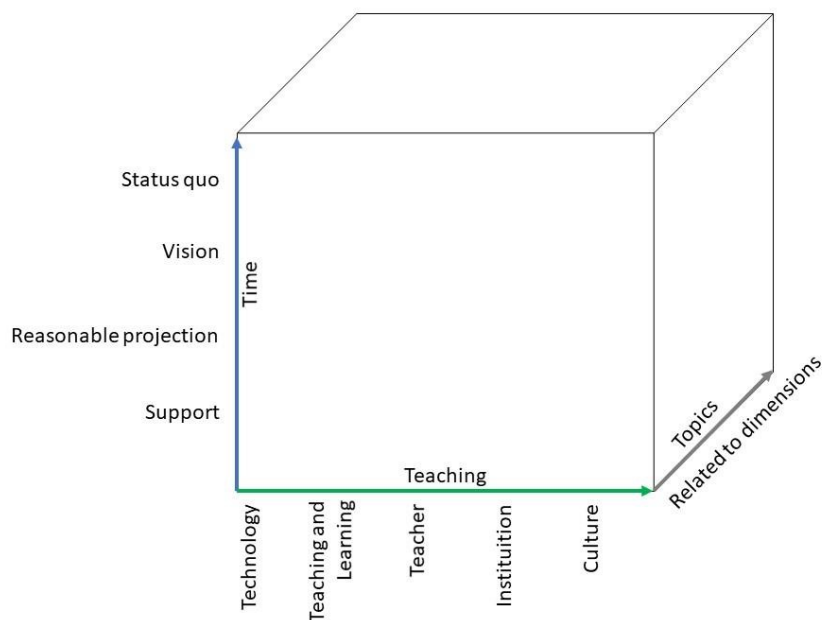


Figure 1. Structure of the interview guideline

The time projections record the status quo, the respondents' vision, a reasonable projection, and the support required from the institution to realise the vision.

The teaching-related dimension addresses technology, teaching and learning, teachers, organisation and culture. This refers not only to the recording of technological tools for digital teaching, but also to the delivery of learning content, the role of teachers, the conditions at the meso and macro levels and the organisational culture. The topic-related dimension specifies the elements of the teaching-related dimensions by considering individual subject areas.

The qualitative data was collected through written documentation of the interviews using keyword protocols. The analysis of the qualitative data follows the technique of qualitative content analysis (Mayring, 1997; 2002) through two evaluation steps:

- The first evaluation step, a summarising content analysis, reduces the interview content to key messages by shortening, paraphrasing and generalisation.
- The second evaluation step is a structuring content analysis (ibid.), in which the content is clustered, organised and structured according to the underlying concepts. An inductive procedure is used to establish a category framework derived from the material using pattern analysis. As the focus here is identifying recommendations, future visions and support needs, not all information has been considered in the analysis.

## **Recommendations for good online teaching**

Although difficulties with regard to technical equipment and barrier-free teaching, assessment and participation offerings that will continue to pose challenges for teachers and students in the next semester cannot be solved solely by the design of the teaching, the interviews reveal tendencies towards measures to successfully and sustainably establish the opportunities of digital and online teaching formats beyond the corona pandemic in order to enable everyone to benefit equally from the advantages.

### ***Onboarding: Activating students and maintaining attention***

Teachers repeatedly stress the special importance of onboarding measures. This can be achieved, for example, by conducting activating exercises at the beginning of the sessions, which should, however, also be used in the further course of an online event to regularly motivate students and maintain their attention. This applies not only, but especially, to phases of chalk and talk.

### ***Communication: Reliable, fast and easy***

A second central aspect relates to the special requirements for communication between teachers and students, which arise from the elimination of face-to-face meetings. A regular, reliable, uncomplicated and timely way of communication and low-threshold communication channels are repeatedly emphasised as being of fundamental importance.

An example for good practice that illustrates this is a weekly opening email that structures the upcoming week by summarising all expectations and commitments.

### ***Learning support: Help and support***

Practical support for students has also repeatedly been mentioned as a central component of good online teaching. Examples of this are, in addition to the weekly mails mentioned above, reminders, information documents or timetables from the teachers.

### ***Learning support: Feedback structures***

For the implementation of blended learning formats, it is essential that the (online) synchronous teaching sessions are well structured. The results of the self-study phases can be presented and discussed. Coaching appointments during the self-study phases complement the feedback options. Teachers provide methodological and content-related advice and support, as well as hints on technical tools, etc., and thus contribute to the motivation of the students through the possibility of exchange.

### ***Learning Support: Portfolio assessment***

Continuous assessment facilitates the knowledge acquisition, as it enables a coherent and structured transition between the attendance and self-study phases.

### ***Good preparation and support for synchronous online teaching***

For the coaching sessions, especially if they take place online in breakout rooms where students can meet in small groups, good preparation of the teachers is important. This also applies to good and detailed preparation of the teaching concept before the start of the course.

### ***Transparency and planning reliability***

The tasks and artefacts to be performed should be defined and communicated in advance, as should the criteria for assessment evaluation. Transparency provides orientation for the students.

### ***Software and hardware: Technical equipment is essential***

When it comes to technologies the perspective is broad. In addition to the applications provided by the HEI for holding online conferences, other established solutions such as Zoom and Jitsi have also been applied successfully. All applications support the implementation of online presence teaching, whereby all applications have advantages and disadvantages. In order to make the (online) presence teaching as interactive and participatory as possible, appropriate technical equipment is required, which concerns both hardware and software. The application of collaboration tools, but also graphic tablets

for life sketching are some examples. Self-study is mostly organised via Moodle and communication is done via email. Students organise themselves and communicate independently during self-study, using numerous programmes, applications and messenger services, such as WhatsApp or Telegram, and platforms such as Google-Drive and Microsoft Teams. Digital teaching also requires adjustments regarding assessment measures. In addition to the analogue formats, which can also be used online, other measures such as portfolio assessment or open book exams are particularly suitable.

## **Needs for support**

The COVID-19 pandemic has brought about a major step forward in the digitisation of teaching. In order to maintain the progress that has been made, targeted and strategic action by the institutions is essential. Support “top-down” is crucial for change and improvement “bottom-up”. In total, six requirements for the organisational structure have been identified, which depend on support from the meso and macro levels. The realisation of these can promote digital teaching and contribute to exploiting the potential on a broad level.

### ***Secure knowledge management and knowledge transfer***

In order to enable and promote the exchange of teaching materials, concepts and experiences among teachers, the HEI should provide an exchange platform. In order to support teachers in digitising their lectures, knowledge management and transfer should be organised in this area, summarising existing and recommended tools and the respective application possibilities. This should include web conference systems as well as other tools, for example for editing videos. In order to support and motivate the production of high-quality teaching material, appropriate technical equipment and software is required. This includes, for example, microphones and cameras, which can be borrowed if required.

### ***Free and uncomplicated access to technical equipment***

A space providing professional lighting and appropriate technical equipment should also be mentioned. This can contribute to the creation of high-quality instructional videos or podcasts.

### ***Qualification and support services***

Teachers are often prejudiced against digital formats due to ignorance or lack of expertise. Coaching and qualification offers as well as special support services for the realisation by technically experienced assistants can help to overcome this hurdle. This can also be done by students.

### ***Renewal of remuneration concepts***

With concepts such as blended learning, synchronous teaching is reduced. A remuneration system which only remunerates according to teaching hours is therefore not transferable to the structure of online teaching formats. Alternative remuneration models must be created, such as remuneration according to communication time as mentioned in the interviews. An appropriate organisational framework can increase the willingness to digitise the teaching offers in high quality.

### ***High-quality teaching materials***

In order to ensure and improve the quality of teaching, high-quality teaching materials must be provided or produced by in-house teaching staff. These should be used across the board and continuously developed.

### ***Uniform, binding and transparent communication***

Uniform, binding and transparent communication of the HEIs digital agenda can increase acceptance among all stakeholders of digital teaching as an integral part of their own teaching. This also includes communicating the expectations of the teaching staff, who can thus gain orientation and creatively design the lectures. In this respect, it is necessary to provide clear framework conditions which, however, also allow teachers sufficient creative freedom.

## **The future of digital teaching**

The visions for the future of digital teaching relate to four aspects: Technology, teaching and learning, teaching, organisation and culture, which are summarised below in a trend monitor.

## **Summary and outlook**

Driven by the special conditions of the digital summer semester 2020, the digitisation of teaching experienced an enormous acceleration. A topic that had just recently still been discussed as a challenge for maintaining sustainability and quality in the future is suddenly a necessary prerequisite for teaching. The corona virus is far from over and not only the coming winter semester has to be organised. Fortunately, the ad-hoc transformation of the entire on-campus teaching to online formats seems to be quite successful so far. In order to identify particularly viable concepts for online teaching in this extraordinary situation, this qualitative explorative study examined good teaching practice at the Baden-Württemberg Cooperative State University.



**Shaping the Next Normal – Explorative Expert Survey among Teachers**

Table 1:

	Vision	Short/medium term (3-5 years)	Long term (5-10 years)
Technology	A trend towards direct and personal communication is emerging: Messenger services such as WhatsApp and social networks such as Instagram are gaining acceptance and in some cases are already finding their way into digital teaching. Digital media such as online scripts, web videos and podcasts can be used to impart knowledge. For courses which are held exclusively in virtual form, these digital formats, in contrast to analogue formats, offer students the opportunity to adapt the pace of learning to their own needs. The use and further development of collaboration tools is also becoming increasingly important. This refers to conference tools such as Zoom or BigBlueButton as well as tools for collaborative writing such as Edupad. In the near future, artificial intelligence will also be introduced into digital teaching, which can further individualise and personalise teaching.	Direct and personal communication via instant messaging services. Use of digital media for knowledge transfer.	AI-based analyses support teachers and students.
Teaching and learning	Courses are increasingly taking place online. Learning is thus detached from the HEI. This creates new requirements to maintain the interest, motivation and attention of the students and to strengthen selforganisation. Interaction becomes indispensable online as well. In addition, there is a need for concepts to develop digital social presence.	Strategies for motivation, strategies for increasing digital social presence, online interaction, active dialogue, knowledge acquisition is self-directed and individualised.	Chalk and talk is being replaced by blended/hybrid learning; the focus is shifting from knowledge acquisition to competence acquisition.
Teachers	The role of teachers is also changing from knowledge transfer to learning guides or coaches. They support the students in the acquisition and consolidation of the teaching content. In order to be able to make full use of the possibilities of digital teaching, knowledge of the technologies and concepts of digital teaching is an integral part of the requirement profile.	High digital competence, continuous further training, teaching companion/facilitator/coach instead of knowledge mediator, digital didactic competence.	/
Institution	The need for participation at the macro and meso level also relates to the role of the Federal Ministry of Education and Research and the HEIs. Study course curricula can be increasingly individualised and personalised as a result of advancing digitisation. Increasingly location-independent teaching formats and thus a large number of polyvalent modules (larger optional courses, also across locations). Artificial intelligence can expand the space of the possible (e.g. recommender systems). Networking of teachers to exchange concepts, experiences and learning materials (exchange platforms, developing digital teaching as a value). Digitisation also influences performance measurement and assessment. New forms of examination that can be taken online will become established (e.g. open book exams or portfolio examinations). Since different forms of examination make sense depending on the subject area, teachers can ideally determine the form of examination themselves (greater flexibility and choice of examination forms by teachers).	Individualisation and personalisation of the curriculum, greater choice through cross-location courses, exchange forums, alternative examination forms.	/
(Organisational) Culture	Digitisation requirements for teaching will continue to increase. Due to the increased rate of academisation and digitisation, the target group of students will become more heterogeneous and diverse. Lifelong learning will also further increase the diversity and size of the student body. However, personal contact between teachers and students will remain a central resource.	Demands on digitisation of teaching are growing, personal contact remains essential.	The student body is expanding.

The aim was to explore which components of online teaching in the digital summer semester should be maintained and transferred beyond the crisis of the pandemic. Based on the qualitative data analysis of an expert survey with teachers that have proven expertise regarding online teaching formats and its implementation into the HEI context, recommendations, future perspectives and support needs have been analysed and presented.

In summary, it can be seen that the success of digital teaching requires one thing above all: a comprehensive restructuring of teaching as a whole. Digital formats require an adaptation of the course curricula, an opening towards open educational resources and open cooperative teaching formats. Furthermore, the relevance of personal contact and rapid communication between teachers and students is emphasised as an important and central component of digital teaching. Furthermore, the importance of the conditions set by the institution of higher education is made clear. Change often occurs in a bottom-up manner, with driving forces within the organisation, an enabling and supporting structure and culture that facilitates this process in a top-down manner is thus essential. This applies to both technical and human resources, but especially to training and support services.

The present paper provides first indications of how the containment measures have affected teaching by presenting a survey among teachers at the Baden-Württemberg Cooperative State University Karlsruhe. Further research in this area and the extension to include the student perspective is recommended.

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## THE IMPORTANCE OF BEING OPEN: HOW EUROPEAN OPEN UNIVERSITIES CAN REPOSITION IN THE POST-PANDEMIC HIGHER EDUCATION LANDSCAPE

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### Abstract

Open universities (OUs) have been at the forefront of educational technology. Designed as innovative and flexible organizations, they have proven instrumental to assure the consolidation of research, innovation and quality practice in distance and online education. Inspired by the impact of open education and MOOCs, traditional higher education institutions began embracing technology-enhanced learning and online education. The growing competition from these universities, as well as of new non-formal providers, have resulted for the OUs in the decrease in student numbers, especially in Europe and North America. With the closing down of campuses due to Covid-19, this growing movement was noticeably accelerated. As higher education prepares for the new normal, how may the European OU remain socially relevant and competitive? Are they still indispensable for assuring quality education opportunities for all, as a growing number of critics question? In this paper we analyse the impact of the pandemic on European OU, discuss possible strategies to meet the challenges of a rapidly transforming higher education landscape, and identify potential trends and models for future development.

**Keywords:** Distance Education, Open Universities, Online Learning, Open Education, Higher Education, Covid-19.

### Introduction

For a long period, since the early 1970's, European open universities (OUs) have been at the forefront of educational technology. At the turn of the millennium, with the accelerated development of digital and connected technologies, they have led the transition to online education, setting the standards for quality practices based on their accumulated knowledge and extensive experience of delivering education at a distance (Weller, 2020; Schuwer & Mulder, 2009; Sangra, 2002). A critical factor supporting this spearheading role

was the OUs' continuous and consolidated leadership in research and innovation in the field of open and online education. (Weller et al., 2018) Moreover, that ground-breaking attitude was strongly anchored in a generation of inspired and often visionary leaders, who knew the field and were, in most cases, also researchers and practitioners.

That scenario is long gone now. In the last decade, OUs have evolved to more mainstream and traditional processes and structures. Leadership has become more professional, even if more detached from the field. In general, OUs have tended to blur in the growing crowd of open education providers and lose that strong differentiating identity from the past. As a consequence, many OUs in Europe have experienced a significant decrease in student numbers and most lost political leverage and power over the years (Teixeira et al., 2019).

The impact of Covid-19 seems to have caught the world by surprise, and that includes Higher Education as well. The long tail effect of the pandemic on universities, which will endure for some years, will push them all to compete directly with OUs in the increasingly hybrid education territory (Witze, 2020). In this emerging context, what kind of response could OUs provide to keep competitive? Are they still indispensable to the higher education systems for carrying out the mission of assuring quality education opportunities for all, as a growing number of critics have come to question?

## **Methodology**

The research process was based on a literature review using both white and grey literature. Careful consideration was given as to the quality of the information sources. The process had 3 stages: first, we reviewed the models of organization and operation of the historical European OUs (OU UK, UNED, Fern Uni, OU NL, UAb and UOC) and collected evidence on how they have responded throughout time to technological and pedagogical change and variable social contexts. Subsequently, we collected evidence on the impact of the pandemic on higher education institutions (HEI) and, in particular, on the OUs' mitigation strategies. Finally, we built a predictable scenario of evolution for the OUs' organization and operation based on the critical analysis of the previous findings.

## **How distance and online education saved higher education worldwide in 2020**

Distance and online learning saved higher education in 2020. Faced with the impact of the pandemic, which forced universities to shut down their campuses worldwide, the only way for them to be able to carry on with their mission was to migrate all teaching and learning activities online. In such an unprecedented context, most universities proved to be unprepared, making use of emergency remote solutions (Hodges et al., 2020).

Unskilled and untrained for their role in this new educational context, most teachers tried to replicate their traditional classroom experiences by simply delivering lectures online through web conferencing systems. In spite of a massive joint effort by authorities, educational institutions, professional organizations and communities, it became evident that most teachers didn't have the necessary digital literacy, or the competences and skills needed to deliver high quality online-based teaching (Gewerc et al., 2020). Across all education subsectors worldwide, similar problems could be identified: difficulties in addressing digital divide issues; teacher and student excessive work overload and consequent digital fatigue; unawareness of personal data privacy and management issues; and a general misconception regarding digital assessment methods (Watermeyer et al., 2020; Sahu, 2020; Reimers & Schleicher, 2020).

If the pandemic crisis has mostly scaled up and sped up an ongoing process of digital transformation of higher education, the unforeseen scale and speed it reached in the last months has introduced a new set of problems and challenges which must be addressed by both policy and research (Hodges et al., 2020; Gewerc et al., 2020). One major conclusion which can be drawn from the crisis is the inefficiency of most of the extensive training and capacity building in online learning carried out in the last decade in traditional universities.

Although OUs proved to be much better prepared for this emergency scenario, still they had to struggle with some difficult, unforeseen challenges. The virtual classrooms remained open and activities kept running as usual. However, similarly to all other universities, the entire faculty, support staff and student body were now teaching, working and learning from home; many in poor conditions, most needing extra care and attention. Good and fluid communication became paramount as well as an increased attention to mental health and well-being of faculty and students. Although teachers used appropriately designed pedagogically approaches, students experienced digital fatigue and forms of depression due to the social context and family environment. Moreover, OUs had to move their student assessment system entirely online almost overnight which proved challenging.

### **In the aftermath of the pandemic: All universities go online**

Having the time and the resources to move beyond a crisis mitigation stage, traditional universities are seizing the opportunity to speed up the process of digital transformation. The aim is to be able to operate in the new digital or hybrid environment keeping the highest academic standards. Despite some resistance from older faculty members and public criticism from opinion-makers, traditional universities worldwide are steadily preparing for the challenges of the new normal. But what does it mean specifically?

To successfully complete the transition to distance and online education, universities will need not only to adjust their methodologies and procedures, but also to transform their organizational culture (Teixeira et al., 2019). The first step for this sustainable transformation will be to assure that governance and university leadership are focused on promoting educational innovation. This implies that they develop a holistic vision which can inspire the university community, align strategic planning with it, and engage all actors in the process.

Also very important for universities will be to develop a digital educational ecosystem which includes not just the learning environment – with the learning management system, the digital repositories, the virtual and remote labs and the e-assessment system – but also the administrative and all other support services. Being this a cultural transformation process, universities should also open up this ecosystem, promoting the use, reuse and remix of open educational resources, and assuring universal accessibility and digital inclusion (Czerniewicz, 2018).

This period of emergency remote teaching has made only more obvious the recurrent difficulties conventional HEI have always had to adopt good practices in distance and online education. By ignoring decades of experience in the field, they are condemned either to resort to familiar, traditional methodologies that do not translate productively to the online context, or to improvise half-baked solutions that focus on technology and gimmicks without the needed pedagogical insight and instructional design strategies.

The digital transformation of traditional universities depends fundamentally on how successfully they develop online pedagogy. For this, establishing a reference model for teaching and learning practices similarly to what the OUs have done will be paramount. Such a framework is quite helpful for both teachers and students, allowing them to adjust their respective practices in this new environment. Another critical point, which became quite evident during the current crisis, is the need to assure quality learner support, especially in such a challenging social context as the one we are all experiencing. The digital transition should lead to a more participatory learning culture, now that changes in how knowledge and information are produced, transmitted or distributed in networks often escape the control of organizations and institutions and, consequently, to solutions that match these new realities in the form of participatory pedagogies. Learning and assessment should be based on trust and collaboration; thus the growing importance of the ethical aspects involved. As Weller (2020; p.189) points out, “the role of technology is becoming ever more pervasive in the educational process”.

However, universities' readiness to overcome the challenges of the new normal will depend mostly on how well they are able to prepare their faculty. Going back to the basics, it's urgent to rethink teacher professional development both in traditional universities and the OUs. The crisis has highlighted the importance of teachers' digital competences, but in order to be effective, teacher training has to be conducted in authentic contexts. This implies teachers should be trained in immersive online-based settings and not in traditional in-person environments. Otherwise, they won't be properly prepared as they won't have the experience of learning online.

### **How to navigate in the new post-COVID 19 higher education landscape?**

Since the early 2000's, digital education has been expanding across HEI worldwide (Teixeira et al., 2019). However, as Taylor signalled (2001), universities started a fifth generation of distance education from a nonsystemic development of scattered initiatives, often the result of random acts of innovation performed by risktaking individual academics. His e-University at the University of Southern Queensland proved how this projects should be "strategically planned, systematically integrated and institutionally comprehensive" (Taylor, 2001).

The move to the online environment has been seen as a natural step in the evolution of all the HEI (van der Zwaan, 2017). In the process, most universities also acquired experience in open education, especially in the form of MOOCs. In spite of some unfulfilled promises, MOOCs have raised the profile of *ed tech* in general, and open practice in particular (Weller, 2020). Moreover, "MOOCs generated a significant amount of media attention and hype" (Weller, 2020; p.130), as probably no other educational technology before. Yet, this scenario didn't lead to a dominance of the distance education universities' model within higher education systems. While the Anadolu University in Turkey, with its student population of over 2 million (Anadolu University, 2019), and the OUs in Asia and Africa continue to attract hundreds of thousands of students each, opposite to what happen in Europe.

The UK's OU faced severe challenges in recent years because of cuts to funding from the government. The same happened with other OUs, which have also seen a decrease in enrolments. A similar phenomenon has occurred in Canada with the more specialized distance teaching institutions, such as the Athabasca University and the T luq University (Allen & Seaman, 2014; Bates, 2017). In fact, the provision of distance and online education by OUs seemed clearly challenged by the unprecedented and rapid popularity of MOOCs in the last decade. This follows on the threat represented initially by the emergence of open educational resources (OERs) and other freely available content on the Internet (Teixeira et al., 2019). The same can be stated about blended or hybrid learning, where students can

combine campus-based and online learning. With much more flexible opportunities for studying, there could be less demand for full distance learning.

Thus, a growing range of competitors have been emerging in the traditional distance education market. All these developments mean that for on-campus universities, what was previously a specialized activity somewhat on the periphery of an organisation (and, hence, organized and often funded differently), had now moved into the core. There is, therefore, a tendency for distance education to be swallowed up in a myriad of diversified practices, most of them without any proper support, both theoretical and practical, to guide their conception and implementation. These phenomena were greatly amplified by the impact of the pandemic in higher education.

In this new adverse context, critical mass and organizational flexibility seem to be critical for the OUs to respond. A perfect example of this was the “Conectad@s: la universidad en casa” (UNED, 2020) initiative in Spain. Faced with the need to design a portal with learning resources to support the emergency online transition of Spanish universities, the Ministry of Education and the Rector’s Council speedily jointly launched a project whose development was led in collaboration by the National Distance Teaching University (UNED) and the Open University of Catalonia (UOC), with the contribution of all other universities. This successful initiative proves the capacity of the OUs to rise to the occasion and quickly address any emergency or a critical social need (Tait, 2013). But do all European OUs have the required dimension, resources and innovation capability to meet these complex challenges?

Their potential for social intervention can be also expressed in smaller scale. Two significant examples of this can be found in the UK and Portugal in the context of Covid-19. Through Future Learn, UK’s OU has decided to offer a free online course on “COVID-19: Tackling the Novel Coronavirus” (Future Learn, 2020). Designed by the experts at the London School of Hygiene & Tropical Medicine it aimed at fighting the conflicting information on the internet and social media. The response was astounding, as over 25,000 learners have signed up, from almost 200 countries. In Portugal, the community of distance and online learning researchers and experts, mostly from the Portuguese OU (UAb), have set an open online community to support the transition to online education, “Ensinar a Distância” (2020), which attracted a large interest and the active collaboration of some of the world’s leading experts in the field.



## **Can open universities reinvent themselves?**

Digital technologies are increasingly becoming embedded and distributed in many of the objects and spaces we inhabit and with which we interact. Digital twins, Internet of Things (IoT), block chains, and Artificial Intelligence (AI) promise to redefine our imagination and future vision of education. All HEI need to deal with this fastchanging landscape and provide adequate forms of access, integration and inclusion. However, as Moore (2007) points out, simply adding technologies to courses does not automatically assure their quality. Using the new technologies to pursue old teaching methods – generally, the content-centred, knowledge transmission approach that has been the paradigm in traditional universities – does not bring substantial gains.

It should be expected that the OUs will be in a better position to deal with the current challenges than traditional universities. Given they have built throughout their history a unique body of research on teaching methodologies and accumulated a large experience of pedagogical innovation, successfully adapting to different technological generations. In fact, traditional universities tend to introduce new technologies and practices as simply a mimetic replacement of conventional teacher-centred approaches. This is clearly demonstrated in the way academics in conventional HEI have misinterpreted the MOOC concept. Ignoring all the previous research and experience in the field of distance education and online learning, the methodologies adopted did not stray too far from the familiar lecture (Teixeira et al., 2019). The same is happening now, with the dominance of videoconferencing platforms as almost the only strategy used, with endless hours of synchronous sessions being confused with modern and effective distance and online learning.

Even if more prepared to deal with a changing technological and social environment, OUs themselves have however struggled to adapt to the pedagogical challenges and opportunities offered by the Internet and social media. Innovative universities, as described by Christensen and Eyring (2011), should evolve from a closed to an open network environment, one in which data and resources are openly and freely shared with fellow institutions and also the community. Such a major change in academia and its validation practices, as well as in many other aspects of how HEI operate), can be hard even for the OUs. Higher education has historically avoided competitive disruption and even the most flexible universities are traditionally very stable organizations, keeping its basic structure and processes unchanged over the years. This is why leaders find it so difficult to reengineer universities as learning organizations.

Christensen and Eyring (2011) explain this obstacle as a result from the power of prestige in the higher education marketplace. In the absence of comparable measures of what

universities produce for their students, the well-respected institutions have a natural advantage. In the case of OUs, a related stabilizing force which has impeded disruptive innovation results from regulation and also from the accreditation process, which in the past made conformance to tradition the price of entry to the industry (Teixeira et al., 2019).

The only way for the OUs to remain an attractive alternative to those seeking a rewarding and modern education is to be able to differentiate themselves once again as institutions specialized in distance and online learning, with a keen pedagogical and instructional innovative approach that incorporates the consolidated and the emergent methodologies and practices: a learning process contextualized by a strong social dimension; an emphasis on a culture of collaboration and of shared construction of knowledge; the promotion of an effective dialogue and interaction with people, resources, and artefacts; the facilitation of a diversified process of encounters, experiences and reflections; a commitment to openness and transparency; a blending of formal, non-formal and informal learning based on networks that interact with one another.

When the OUs were created in the seventies and eighties, they stood apart because they were organised according to an innovative model, which unbundled the typical components of the teaching process in order to be able to reproduce at scale, reassembling them in a new format. By unbundling once again teaching and learning processes and outsourcing services (Teixeira et al., 2019), as well as re-bundling them into new forms (Czerniewicz, 2018) according to variable contexts, OUs will gain increased flexibility, critical dimension and resource capability. This will allow them to respond to a rapidly changing environment, thus carrying on their mission of providing quality learning opportunities for all. But, by doing it in such a way, they must go against an important part of their DNA and tradition, which is to continuously grow bigger in size (Christensen & Eyring, 2011). The new approach should be to cooperate within networks. The transition to such a disruptive innovation-based model requires vision, time, detailed planning and consistent development.

### **The key is open research & innovation, and social agency**

As Tait describes, OUs “through scale and flexibility [...] can in terms of social policy provide a pressure valve to release frustration about educational opportunity; can deliver large scale opportunities for professional development that support improvement in quality of service and economic growth; and can support the development of an educated citizenry and so nourish self-fulfilment and democracy.” (Tait, 2013; pp.5-6). The core mission of the OUs, independently of regional context, is to educate for individual transformation and social change. OUs shouldn't lose that ultimate goal of their activity, as it's what gives them substance and relevance.

## **The Importance of Being Open: How European Open Universities can Reposition in the Post-Pandemic Higher Education Landscape**

The uniqueness of OUs' legacy lies also in another major factor. The introduction of educational technology has not been aimed at increasing teaching and learning efficiency, but at making the process accessible and affordable for all, as well as flexible to every context. Educational research and innovation are thus at the core of every OU identity and should be taken as such by institutional governance. But in order to be coherently practiced, it should be organised within a similar open framework to the one described in the previous section. The concept of open science has extended the same principles of openness of the educational process to the whole research cycle as well. OUs should therefore spearhead the reorganization of research and innovation practices, applying the principles of their own educational philosophy and promoting open access, open publication, open data, open peer review, open innovation, and open licensing. This is not yet the scenario, however, since not many European OUs seem to be at the forefront of the open science movement.

### **Conclusions**

Faced with a growing competition in distance and online learning from traditional HEI, and at risk of losing the leadership in research and innovation on educational technology, the European OUs are recognizing the need and the urgency to reorganise and adjust to a new emerging higher education landscape. How should they position in this new context? How can these institutions remain relevant and competitive?

The findings from our research show that the OUs have still a major role to play. This is being demonstrated in the current pandemic crisis. The OU's mission, values and tradition equip them well to address the social inequities which arise from the global digital transformation. In order to pursue that goal, the OUs need to adopt a more caring and personalised pedagogical approach and rebuild their institutional identity around the notions of openness, innovation and social agency. In addition, their operation model should be updated as to enable them to fully embrace these core values. But, from a disruptive and more differentiating perspective. Findings suggest also that the OUs would benefit from adopting fully open network-based collaborative environments, unbundling their processes and outsourcing services, sharing resources and developing a true knowledge digital ecosystem.

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## A LITERATURE REVIEW OF HIGHER EDUCATION REFORM AND LIFELONG LEARNING IN A DIGITAL ERA

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### Abstract

Policy documents have long emphasized lifelong learning, social development, global competition and employability. At the same time, how higher education needs to be transformed to meet this demand for creating opportunities for lifelong learning is an important issue. This study seeks to take on the literature through the exploration of two main constructs: lifelong learning and higher education reform, answering the question of which key themes of lifelong learning, if any, are emerging in higher education reforms. Using a systematic review of relevant, foundational, and current published literature on lifelong learning and higher education reform, the twostep selection of the publications is presented. Key themes are discussed as well as next steps in the continued study with the systematic literature review in which selected articles will be read by and expert panel. How lifelong learning and higher education reform can create a diverse higher education system which will address diverse students and required competencies in diverse, dynamic societies will be of importance for future study.

**Keywords:** Higher education reform, Lifelong learning, Systematic literature review

### Introduction

Lifelong learning is an issue that has been under debate for many years. Among other things, its place in the educational system has been discussed. In the past, many reforms have been introduced to enable opportunities for lifelong learning. These reforms have discussed the different shape it takes, such as issues relating to formal, non-formal and informal aspects of learning from a lifelong and life wide perspective. Moreover, these reforms have linked lifelong learning to the development of the society. Therefore, transnational organisations and countries all over the world have included the concept of lifelong learning in their policy documents. These policy documents have various motives for emphasising lifelong learning; social development, global competition, employability,

and so on (Jaldemark, 2020). What they have in common is the aim to transform the educational system to enable the creation of opportunities for lifelong learning.

This transformation and policy development also link to the emerging digitalization, another global societal trend that intersects with the rising emphasis on lifelong learning. From an educational perspective, the emerging digitalization is a process that changes the conditions for learning and communication between humans by enabling multiple and innovative ways of combining places, time-zones, and digital technologies and resources. This trend impacts educational systems in general and higher education in particular by including innovative and transformative opportunities for learning that enable asynchronous and synchronous participation in formal, informal, and non-formal educational settings.

Policies that discuss the transformation of higher education to include digitalization and lifelong learning is common. These policies emphasize the need to be up-to-date with the impact the emerging digitalisation has on working life and the role of higher education in changing the society. This leads to ideas of transforming the role higher education have in national educational systems as well on a global scale. Therefore, both the rising emphasis on policies that enable development of opportunities for lifelong learning and the emerging digitalization creates new conditions for being a citizen. Therefore, this paper aims at discussing reformation of higher education in the light of the rising emphasis on lifelong learning and the emerging digitalization. The development discussed above sums up in the following research questions:

- How does lifelong learning fit into the current digital trends of higher education reforms?
- Which key themes of lifelong learning are emerging in higher education reforms?

## **Background**

We draw from a historical and growing literature to explicate the two main constructs in this study: lifelong learning and higher education reform. Below we identify seminal thinking about these two interrelated phenomena and a rationale for studying them together. Although this scholarly work commenced prior to the 2020 Covid-19 global pandemic, the needed response to such an event only highlights the need for agile, competent lifelong learning. Everyone had much to learn in short periods of time from many information sources with varying levels of accuracy. The adjustments to higher education structures during the pandemic adds evidence to our argument as learning design and delivery changed in the name of needed flexibility and multi-modal learning. Required changes in higher education, combined with the need for lifelong learning that is well-planned and implemented, can have wide reaching and valuable outcomes. In this

phase of our study, we seek to systematically identify and review literature that addresses the following question: Which key themes of lifelong learning, if any, are emerging in higher education reforms?

### ***Evidence of a need for lifelong learning***

Given that societies are increasingly dynamic, globally connected, and socio-economically complex, there is a need to foster technology-enabled digital lifelong learning capabilities among societal members. This is one of many reform requests laid at the academic doors of higher education institutions. Learning across one's lifetime is captured in the phrase *lifelong learning* and is defined by Jarvis (2014) as a process where individuals of any age and with broad interests acquire knowledge and skills. Established teaching institutions is one way of delivery, but not the only one (p.53). Higher education institutions can play two roles in the lifelong learning space. They can ensure that graduates of formal, credit, and accredited programs are empowered with skills required to be a lifelong learner. Those same institutions can also offer continuing and extension education courses and programs designed for the needs of prospective and current lifelong learners. The delocalization of education programs through the affordances of digital resources and technology-enabled learning applies when designing for lifelong learning as well as traditional programs. This fact alone positions higher education institutions to be central, if not the only, purveyors of lifelong learning.

Seminal thinking is found in Delor's et al. (1996) four pillars of learning as fundamental principles for embracing lifelong learning. This work applies in both the roles of higher education can play for lifelong learning identified above. *Learning to know* means that education should provide the cognitive tools required for an individual to better comprehend the world and its complexities, and to have an appropriate and adequate foundation for future learning. Learning to know can be understood as a synonym of learning to learn in order to benefit from the opportunities offered by lifelong learning. *Learning to do* focuses on acquiring professional qualifications and soft skills such as the ability to cope with diverse situations and to work in a team. Education should provide the skills to help enable individuals to effectively participate in the global economy and society. *Learning to live together* focuses on developing an understanding of others and the reality of interdependence relating to human rights, democratic principles, intercultural understanding, and peace and harmony at all levels of society. *Learning to be* requires that education provide self-analytical and social skills to enable individuals to develop to their fullest potential as a whole person: psycho-socially, affectively, and physically.



### ***Current trajectories of higher education reform***

For Broucker, de Wit, and Leisyte (2016), higher education reform will include a restructured public sector. By contrast, Williams (2016) identifies a need for a more socially appropriate response from education; education not just for maintaining the status-quo or in support of the elite, but instead toward the greater good. From either view, here are opportunities for education to better align to the needs of students and society. Multiple societal transformations, acting as a catalyst for higher education reform, are identified in published literature (Bryce, Iglesias, Pullman, & Rogova, 2016; Duderstat, 2009; Keeling & Hersh, 2011). These transformations include:

- information access and quality;
- cost-containment and affordability;
- globalization of human activities;
- employment sector transformation;
- 21<sup>st</sup> century core capabilities,
- continuous technology expansion and integration;
- changing student demand, demographics, and resulting needs.

The need to reform higher education in line with societal changes is well articulated in government documents and academic literature (Jones, 2013). A systematic approach to turn such demands into reforms, with an evidence-base to guide such action, underpins this study.

We note the previous work of Slowey and Schuetz (2002) who identified a new way of seeing higher education in reference to society. For Slowey and Schuetz, traditional forms of delivery are often missing attention to the needs of more diverse learners. They suggest this attention to diverse needs will embrace the needs of lifelong learners, putting the campus into what can be called “lifelong learning mode” (Schuetze & Slowey, 2002; p.324). A move toward a lifelong learning mode of delivery can address the broader demands for change in higher education coming from government agencies and the students themselves. A diverse higher education system will address needs of diverse students and the required competencies in diverse, dynamic societies. (Cleveland-Innes, 2020).

### ***Method***

This study begins with a systematic review of relevant, foundational, and current published literature on lifelong learning and higher education reform. Proposing any new conceptual relationships without thorough reference to existing empirical and theoretical evidence creates poorly constructed tests of new relationships. This is particularly erroneous in the practice-oriented, social science field of education; garbage in, garbage out and ineffective educational practices are the result. According to Auger (2009), “social scientists face the

problem of information overload. Indeed, the provision of scientific information largely exceeds the human capability of absorbing it all” (p.1032). Common reviews of the literature, while helpful, are often “inconsistent, non-critical and unsystematic reviews” (ibid; p.1032).

This systematic review of identified literature addresses our central question about the relationship between lifelong learning and higher education reform. In doing so, we “adhere closely to a set of scientific methods that explicitly aim to limit systematic error ... in order to answer a particular question” (Petticrew & Roberts, 2006; p.9) or questions. Petticrew and Roberts offer a well-used seven-step approach to systematic reviews of the literature in the social sciences that goes well beyond the usual mathematical models of meta-analyses in order to answer questions about human experiences (Suri & Clarke, 2009). We seek conceptual definitions, common practices, measurement options, and possible conceptual overlaps, if any, between higher education reform and lifelong learning. The following information outlines the selection process for, and the listing of, published resources used in the study.

After discussions and an agreement on a focus on technology enhanced or technology enabled lifelong learning and workplace learning in higher education, the first search string was composed as: (“Lifelong learning” OR “Workplace learning”) AND “Higher education (change OR reform OR policy)” AND (“technology enabled” OR “technology enhanced” OR “blended learning” OR “informal learning” OR “non-formal learning”). A search string with an ending that should not only find studies on formal learning, but also on non-formal and informal learning resulted in approximately 3,500 hits in Google scholar. This was too high a percentage of white papers, position papers and conference articles with weak methodology. Furthermore, the high percentage of articles on the more technical aspects of technology enabled or technology enhanced learning also seemed too high.

The next step to fine-tune the search was to set some inclusion/exclusion criteria and to modify the search string. Like most other research fields this is an evolving one, and the first criterion was set to only include articles and book chapters published in 2016 or later. The other criteria were to exclude white papers, low quality position papers, studies with poor research methods, and articles that did not relate to the aim of this study. To retrieve fewer technical studies and to get a better focus on change, reform and policy in higher education the search string was modified to: (“Lifelong learning” OR “Workplace learning”) AND “Higher education (change OR reform OR policy)” AND (“blended learning” OR “informal learning” OR “non formal learning”). After a quality assessment according to the inclusion/exclusion criteria, 26 articles were selected for further close reading.

## Findings

As noted above, after a quality assessment according to the inclusion/exclusion criteria, we selected 26 articles for further close reading. The selected publications with selected themes can be found in Table 1 in the next section below.

Table 1: Set of publications and selection of themes

Publication	Selection of themes
Asfiati, A., & Wekke, I. S. (2019). Lecturers' participation in applying blended learning in Islamic higher education in Indonesia. <i>Universal Journal of Educational Research</i> , 7(12), 2604–2608.	Blended learning, improved student skills for lifelong learning.
Baptista, A. (2016). Revisiting lifelong learning in light of the Bologna process and beyond. <i>Lifelong learning: Concepts, benefits and challenges</i> , 17–35.	Lifelong learning, Bologna process.
Boyadjieva, P., & Ilieva-Trichkova, P. (2018). Lifelong learning as an emancipation process: A capability approach. In <i>The Palgrave international handbook on adult and lifelong education and learning</i> . (pp. 267–288). London: Palgrave Macmillan.	Lifelong learning, social and institutional contexts, values.
Bohlinger et al (2016). Validation of non-formal and informal learning in Europe: Research, policies, legitimacy and survival. In Souto-Otero, M. <i>Education policy</i> . Frankfurt/Main: Peter Lang.	Policy-making in validation of nonformal and informal learning, exclusion and inclusion.
Bridgstock, R. (2017). The university and the knowledge network: A new educational model for twenty-first century learning and employability. In <i>Graduate employability in context</i> (pp. 339–358). London: Palgrave Macmillan.	Employability, new university model as experiential, social and networked.
Cleveland-Innes, M. (2020). Student Demographic Change and Pedagogical Issues in Higher Education. In <i>Inequality, Innovation and Reform in Higher Education</i> (pp. 159–173). Springer:Cham.	Needed shift in HE, student characteristics and needs, levitating pressure on faculty.
Gaebel, M., Zhang, T., Bunescu, L., & Stoeber, H. (2018). Learning and teaching in the European Higher Education Area. <i>European University Association asbl</i> .	Collaboration across universities, inclusion of other stakeholders.
Ishak, M. M., Ali, H., Rahim, F. A., Bakar, M. S. A., Ariffin, T. F. T., & Malaysia, S. K. (2018). Managing Learning and Teaching Orientation of Online Centered Approaches in Higher Learning: “MOOC” and Beyond. In <i>Educational Access and Excellence</i> , 1, 119.	Collaborative management approach, globalised online learning, learning and teaching.
Jacobs, A. H. M. (2018). Values, institutional culture and recognition of prior learning. <i>South African Journal of Higher Education</i> , 32(4), 96–106.	Critical hermeneutics, HE, policy, culture, values.
Jamaludin, R., McKay, E., & Ledger, S. (2020). Are we ready for Education 4.0 within ASEAN higher education institutions? Thriving for knowledge, industry and humanity in a dynamic higher education ecosystem. <i>Journal of Applied Research in Higher Education</i> .	Educational ecosystems in HE, seeking Education 4.0.
Kagan, C., & Diamond, J. (2019). Massification of Higher Education and the Nature of the Student Population. In <i>University–Community Relations in the UK</i> (pp. 51–76). Palgrave Macmillan, Cham.	Policies and practices to embrace diverse populations in widening participation in HE.
Kasworm, Carol. “Adult Workers as Learners in the USA Higher Education Landscape.” In <i>Inequality, Innovation and Reform in Higher Education</i> , pp. 221–235. Springer, Cham, 2020.	Need for HE to rethink mission, target student clientel, specific focus on adult Higher Education.
Lim, C. P., & Wang, T. (2016). A framework and self-assessment tool for building the capacity of higher education institutions for blended learning. In <i>Blended learning for quality higher education: Selected case studies on implementation from Asia-Pacific</i> , 1–38.	Capacity building in HE and the capacity of to drive, sustain and scale up their blended learning practices.
Matheos, K., & Cleveland-Innes, M. (2018). Blended learning: Enabling higher education reform, <i>Revista Eletrônica de Educação</i> , 12(1), 238–244.	The need for blended learning to situate itself, timely and crucial HE Reform
Petersone, M., Krastins, A. V., & Ketners, K. (2016). Implementation of Lifelong Learning for Improving Customs Education System in Latvia and the World. <i>International Journal of Education and Learning Systems</i> , 1, 27–36.	Lifelong learning opportunities for the implementation of measures to improve the education system.
Sá, M. J., & Serpa, S. (2018). Transversal competences: Their importance and learning processes by higher education students. <i>Education Sciences</i> , 8(3), 126	Cross-disciplinary training towards continuous, lifelong learning.

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Santos, L., Bago, J., Baptista, A. V., Ambrósio, S., Fonseca, H. M., & Quintas, H. (2016). Academic success of mature students in higher education: a Portuguese case study. <i>European Journal for Research on the Education and Learning of Adults</i> , 7(1), 57–73.	Explores the academic success of mature students in HE.
Sheridan, L., Gibbons, B., & Price, O. (2019). Achieving WIL Placement and Theoretical Learning Concurrently: An Online Strategy for Higher Education Institutions. <i>Journal of University Teaching and Learning Practice</i> , 16(3), 8.	Dynamic Systems Development. Method (DSDM) for supporting work integrated learning and internships.
Smith, G. A. (2019). Framing Faculty Development as Workplace Learning, <i>Journal on Centers for Teaching and Learning</i> , 11, 3–23.	Social workplace learning, for teacher development.
Souto-Otero, M. (2016). Validation of non-formal and informal learning in Europe: Research, policies, legitimacy and survival. <i>Education policy</i> . Frankfurt/Main: Peter Lang.	Importance of validation for EU-policy and the consequences related to exclusion and inclusion.
Spring, K., & Graham, C. (2017). Thematic patterns in international blended learning literature, research, practices, and terminology. <i>Online Learning Journal</i> , 21(4).	Informal workplace learning experiences of graduate students.
Tikhonova, E.N., & Raitskaya, L. (2018). An Overview of Trends and Challenges in Higher Education on the Worldwide Research Agenda. <i>Journal of Language and Education</i> , 4(4 (16).	The transformation of HE, student teacher relationship, social equity and access to HE.
Unluhisarcikli, O. (2018). Informal workplace learning experiences of graduate student employees. <i>Australian Journal of Adult Learning</i> , 58(1), 66.	Conditions for workplace learning and informal learning, PhD-students.
Volungevičienė, A., Teresevičienė, M., & Ehlers, U. D. (2020). When is open and online learning relevant for curriculum change in higher education? Digital and network society perspective. <i>Electronic journal of e-Learning</i> .	Open online learning for curriculum change in HE to respond to digital and network society learning needs.
Webb, S., Dunwoodie, K., & Wilkinson, J. (2019). Unsettling equity frames in Australian universities to embrace people seeking asylum. <i>International Journal of Lifelong Education</i> , 38(1), 103–120.	Explores university access for for refugees and people seeking asylum.
Weil, M., & Eugster, B. (2019). Thinking outside the box: De-structuring continuing and higher education. <i>Disciplinary Struggles in Education</i> .	Comparison of HE (HE) and Continuing. Education Training (CET) in qualifications.

## Discussion

In returning to the research question, which key themes of lifelong learning, if any, are emerging in higher education reforms, the review of the 26 articles resulted in a selection of five articles. These publications can be said to represent and characterize global themes regarding challenges in creating a closer connection between lifelong learning and HE of interest for continued and deeper study. The first article selected was Baptista (2016), which drawing upon European policy presents LL for economic development, personal development, social inclusiveness and democratic understanding and activity in HE. Kasworm (2020) argues for a rethinking of the mission of HE with a specific focus on adult undergraduate students who more often are workers as well as students. Boyadjieva and Ilieva-Trichkova (2018) provide a theoretical outline of the heuristic potential of the capability approach in conceptualizing lifelong learning and the capacity of this approach to guide empirical studies on lifelong learning. A stronger relationship between HE research and CET professional activity such as more collaborative engagement between HE and CET is necessary to include the importance of applied, practitioner research in professional fields is explored in the fourth article by Weil and Eugster (2019). The final article, Jamaludin and Ledger (2020), presents the challenges seen in HE and the need for a new dynamic HE ecosystem and Education 4.0. Together we viewed these articles to

encompass multiple societal reforms pushing towards reform of HE (Bryce, Iglesias, Pullman, & Rogova, 2016; Duderstat, 2009; Keeling & Hersh, 2011).

## Conclusions and next steps

In further study, this review has provided deeper insights into the necessary changes and reform in HE to create and promote beneficial conditions for lifelong learning and higher education along with forms of higher continuing education. In the next step of the review, we will present these five articles for close reading by an expert panel in line with the Delphi method (Brady, 2015). The comments and insights of the expert panel will provide a deeper understanding of the need for change and reform in HE. This continued study aspires to provide a knowledge contribution regarding how, given the possibilities, which technology offers, the importance of connecting lifelong learning, change and reform in higher education.

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## ARTIFICIAL INTELLIGENCE AND LEARNING ACTIVITIES: A MATCH MADE IN HEAVEN?

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### Abstract

Artificial Intelligence in Education (AIED) may be described as the next big disruptor in higher education, however, AIED still only remains “evidence of a potential” Balslev (2020). Practical experience with AI in higher education is very limited and potential pedagogical applications of AI has so far not been given much attention. The objective of this paper is to analyse and discuss concrete applications of AI to support different learning activities in higher education using the ABC Learning Design approach Young and Perovic (2016). The purpose of the paper is to contribute to research in the practical use of AI in higher education by presenting the AI Pedagogy Planner and to start the important theoretical discussion of AI applications from a pedagogical point of view. The paper is based on empirical data from nine selected cases of AI use in higher education in Portugal, the United Kingdom and Denmark, respectively. The analysis demonstrated that there is a need for new views on the pedagogical use of AI in higher education. However, the paper goes further and outlines an AI Pedagogy Planner combining six overall learning activities with eight types of AI applications.

**Keywords:** AIED, learning types, AI applications, AI pedagogy planner

### Introduction

The purpose of this paper is to analyse and discuss pedagogical applications of artificial intelligence in higher education and to answer the overall question: which AI applications support specific learning activities in higher education?

The study draws on empirical insights from a structured analysis of nine different cases, describing nine AI applications in higher education in Portugal, the United Kingdom and Denmark, respectively. The analysis of the nine cases focused on particular parameters

that are relevant for pedagogical and/or didactical factors related to the actual use of AI in Education.

In a recent article offering a systematic review of research on artificial intelligence applications in higher education, Zawacki-Richter et al. (2019) ask a crucial question. Based on their comprehensive systematic review they ask: “where are the educators?”

This question has been raised before by Holmes et al. (2019) and in other variants by Rienties et al. (2020) and Simonsen (2020), and it is definitely about time that we discuss potential pedagogical approaches to artificial intelligence applications in higher education. The analysis of the nine cases used in this paper are related to the question raised. We will try to answer that question and offer a theoretically based discussion of how elements from the ABC Learning Design Approach Young and Perovic (2016) can be combined with an emerging framework outlining potential applications of different AI technologies, based on the three-tier classification developed by Luckin et al. (2016) and Holmes (2019).

So, the paper will first briefly introduce and discuss the different theoretical building blocks. Then it will provide an analysis and discussion of the nine cases and suggest an AI Pedagogy Planner, which may help educators select the right kind of AI application to support specific learning types. Finally, conclusions and reflections on further work will be presented.

## **AI Applications and Pedagogy in Higher Education**

As already indicated, existing literature does not fully discuss the link between AI applications and potential learning activities in higher education. Holmes et al. (2019) do discuss how AI works in education and how different AI applications work in education, but they do not propose an overall pedagogical framework of which type of AI application can be used to support specific learning activities. Zawacki-Richter et al. (2019) even ask, “where are the educators?” and the educators have so far played an almost non-existing role in the development of AI applications for higher education.

That is unfortunate because we might miss the huge potential of AI applications without a clear pedagogical approach. Also Rienties et al. (2020) call for increased cooperation between different disciplines to gain the full potential, and Simonsen (2020) points out that we have not come very far when it comes to the actual practical use of AI in higher education. In a more critical view, Balslev (2020) criticises the application of technology and AI in higher education and calls it “Evidence of a potential”.

In other words, there seems to be a need for a specific approach to AI pedagogy, which focuses not only on what AI can do, but also on which learning activities and learning objectives can be supported by AI applications. That is the conceptual vision of this paper.



## Artificial Intelligence and Learning Activities: A Match Made in Heaven?

However, it needs some solid theoretical building blocks and, for that purpose, the framework presented in Holmes et al. (2019), and later refined and expanded in Bidarra et al. (2020) should be presented.

The overall classification of learning and artificial intelligence suggests three overall types of AI in education. The classification is important as it divides the overall uses of AI in education into three areas being *Learning with AI*, *Learning about AI* and *Learning for AI*.

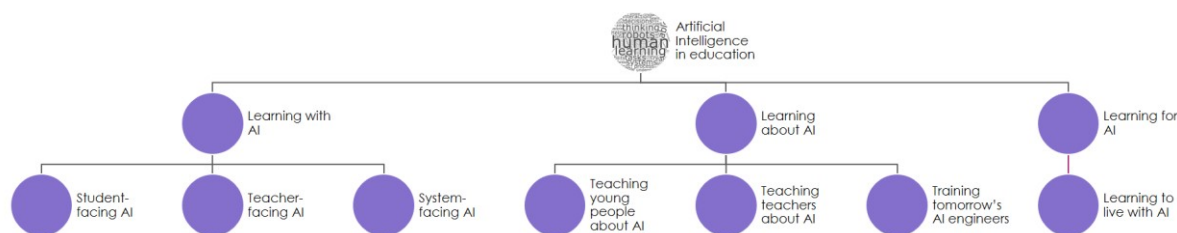


Figure 1. Learning with AI, learning about AI and learning for AI

This overall classification is useful when defining what type of learning we are aiming at, and as such the three categories form the basis of the AI Pedagogy Planner, which will be presented later.

The next theoretical building block is the emerging framework outlining existing AIED technologies based on Holmes et al. (2019). This approach has been updated and streamlined by Bidarra et al. (2020) and is shown below in Figure 2.

The upper section of Figure 2 outlines whether the solution in question supports learning with AI, learning about AI or learning for AI and the lower section outlines a non-exhaustive list of different AI applications, cf. Holmes et al. (2019).

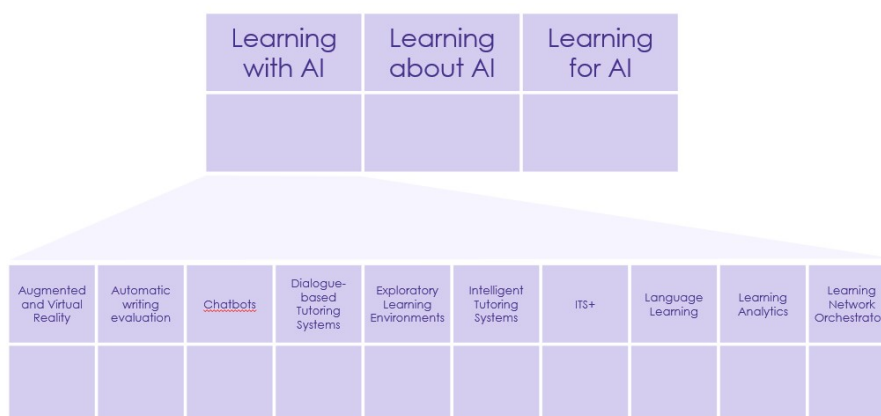


Figure 2. Framework of AI learning types and AIED technologies

These two theoretical building blocks make it possible to categorize the overall purpose of an AI application and to present an overall description of the AI solution in question.

However, we still miss a recognized pedagogical approach that allows us to describe systematically what AI applications to use when supporting specific learning activities and reaching specific learning objectives. We need the third theoretical building block.

For that purpose, we selected elements from the ABC Learning Design method Young and Perovic (2016), which builds on Laurillard's six learning types Laurillard (2012). The ABC Learning Design approach is a method where educators work together in teams to design a visual storyboard outlining the structures and sequences of learning activities, which are required to meet specified learning outcomes.

For this discussion, only the overall learning types are used. The six learning types outlined in the ABC Learning Design method Young and Perovic (2016) include:

- Acquisition;
- Collaboration;
- Discussion;
- Investigation;
- Practice;
- Production.

The definitions of each learning type can be found in Young and Perovic (2016) and are written on the actual cards used in the ABC Learning Design method.

These three building blocks constitute the theoretical basis of this paper and before we turn our attention to the AI Pedagogy Planner, we need to take a look at the nine cases that form the empirical basis of this paper.

### **Nine Cases on AI in Higher Education**

One of the research objectives of the AI in Teaching project (AIT) supported by ERASMUS+ (KA203-2019-002) was to identify and analyse cases in Portugal, the United Kingdom and Denmark, respectively.

The AIT group has identified nine cases, which are listed by country and shown below in Figure 3.

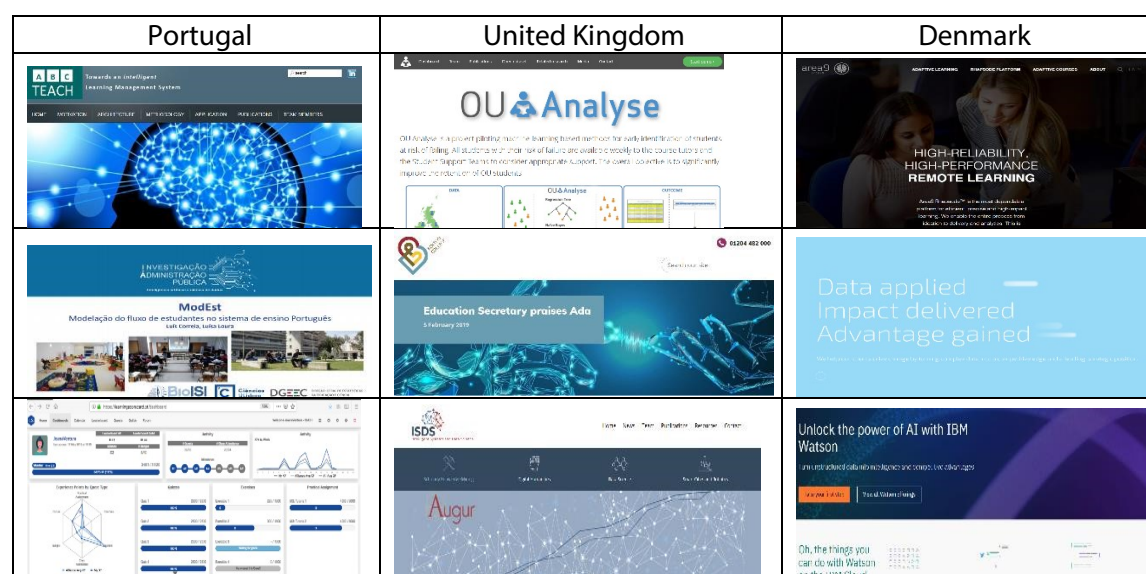


Figure 3. Screenshots of the nine cases

All nine cases were found in higher education and were analysed on the basis of the following items:

- Context;
- Description of AI application;
- Categorization of AI application;
- Actors (Students-Teachers-Researchers-Decision-makers);
- Conclusion.

Based on this study it was possible to analyse the nine cases and categorize them by AI learning type and AI applications. Figure 4 below shows the nine cases categorized using first the AI learning types and secondly the AI application types.

	ABCTeach	ModEst	LearningScorecard	OUAnalyse	ADA-Chatbot	KMI	Area9	SDU	DKEA
AI Learning Types									
Learning With AI	X	X	X	X	X	X	X	X	X
Learning About AI									
Learning For AI									
AI Applications									
Automatic Writing Evaluation									
Chatbots					X				
Dialogue-based Tutoring Systems									
Exploratory Learning Environments									
Intelligent Tutoring Systems	X	X	X				X		X
Language Learning									
Learning Analytics				X		X		X	
Augmented/Virtual Reality									

Figure 4. Categorization of the nine cases

The results show that all nine cases are under the *learning with AI* category, and that there was 1 chatbot application, 3 learning analytics applications and 5 intelligent tutoring system applications. Furthermore, the analysis showed that none of the nine cases was based on pedagogical considerations, which was a finding, which supports the call for

including educators in AIED development, cf. Zawacki-Richter et al. (2019). Although the sample is small, it points to a need for combining pedagogical considerations with AI.

## **AI Pedagogy Planner**

The idea of using a design approach in building programmes has had a huge impact on educators and researchers all over the world, and in this case, inspiration to develop the AI Pedagogy Planner came from Bower (2008), Laurillard (2012), Salmon (2013) and Fung (2015). Let us first outline how the ABC Learning Design method works.

The actual process used in the ABC Learning Design method is based on a practical and hands-on approach where educators are asked to develop a programme using a storyboard and cards. The storyboard structures the programme in question in a timeline, and the cards are placed in the desired sequence to support the learning objectives in question. On the front of the learning type card the overall type of learning appears and the educator places several learning type cards on the storyboard, structuring the overall learning programme. All these choices are of course made to support the learning objectives of the programme. Once satisfied with the overall approach, educators then flip the learning type cards and select or define the actual learning activities on the back of the card in question. Having gone through this process all pedagogically relevant choices have been made and educators can now start developing the specific didactical activities in the classroom or the LMS in question. The same idea was used to develop the AI Pedagogy Planner, which is shown in Figure 5 below.

Again, the underlying idea was to develop a practical tool for educators when working with AI in higher education. In line with the ABC Learning Design method, the idea is to make pedagogically relevant decisions in a specific sequence.

The AI Pedagogy Planner is a so-called decision support tool, where you start with the inner white wheel. First, you select the type of learning that you want to work with at a particular stage in your curriculum design by turning the inner wheel either left or right. The abbreviations ACQ, COL, DIS, INV, PRA, and PRO are the six learning types listed in the left-hand side of Figure 5.

Having selected the learning type, then it is time to select the AI learning types, cf. Holmes et al. (2019) and Bidarra et al. (2020). The educator now selects the AI learning type in question, that is, whether it is *Learning with AI*, *Learning about AI* or *Learning for AI* by turning the second light-grey wheel. The abbreviations LWAI, LAAI and LFAI are the three AI learning types listed in the left-hand side of Figure 5.

## Artificial Intelligence and Learning Activities: A Match Made in Heaven?

Next, it is time to select the actual AI application, which the educator can use to realize the didactical learning activities required. The educator now turns the outer dark grey wheel and selects the AI application(s), which support(s) the selected learning type in question.

Once the learning type, the AI learning type and the equivalent AI applications have been selected, the educator flips the decision tool and gets concrete pointers to actual exercises, practical learning activities and AI tools that may be used to realize the learning outcomes of the programme in question on the back of the AI Pedagogy Planner. The abbreviations AWE, CB, DBTS, ELE, ITS, LL, LA and AR/VR are abbreviations of different AI applications listed in the left-hand side of Figure 5.

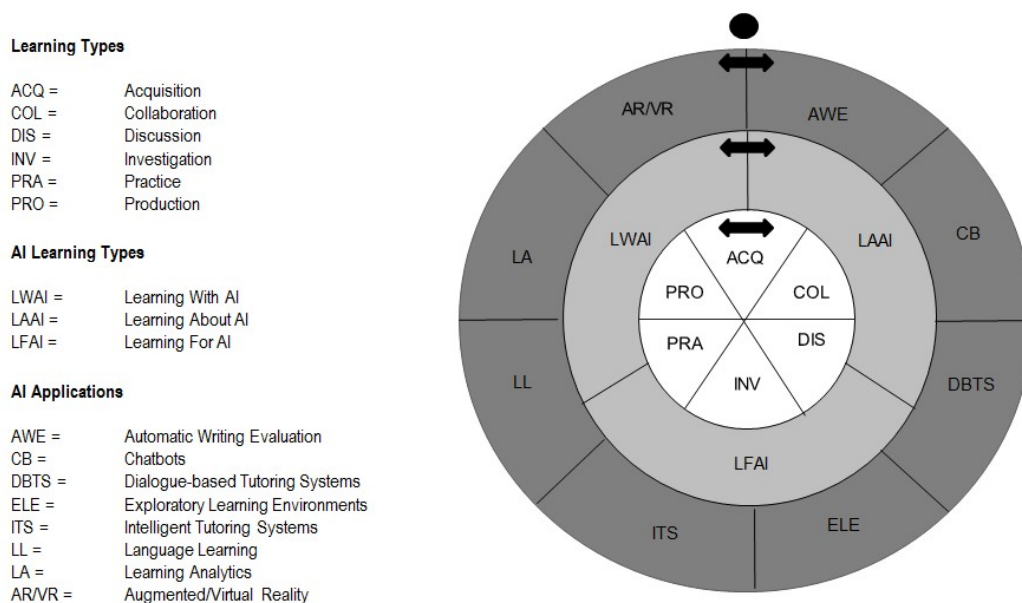


Figure 5. AI Pedagogy Planner

## Conclusions and further work

This paper analysed and discussed pedagogical applications of artificial intelligence in higher education and examined how AI applications may support specific learning activities in higher education. The discussion was based on nine cases of AI applications in Portugal, the United Kingdom and Denmark, respectively and the insights gained from the study led to the development of the decision support tool called the AI Pedagogy Planner. We argue that this specific decision support tool may help educators select the right AI applications for the right learning types realizing the right learning activities.

During the analysis of the nine cases, it was found that all nine cases could be categorized as learning with AI and that five out of eight AI applications were categorized as intelligent tutoring systems. It was also found that none of the nine cases included detailed theoretical considerations on how the solutions in question could be used pedagogically. We contend that the decision support tool based on a picker wheel approach to AIED could be used in

practice by educators to facilitate pedagogically based decisions in the process of building the curriculum in higher education. Artificial Intelligence and learning activities are in fact a match made in heaven, but educators should lead AI – not be led by AI.

Consequently, further research in pedagogically based development of AI applications is needed to be able to integrate them in the physical classroom or in the virtual learning environment, cf. Luckin and Holmes (2017).

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## ARTIFICIAL INTELLIGENCE AND VOCATIONAL EDUCATION AND TRAINING – PERSPECTIVE OF GERMAN VET TEACHERS

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### Abstract

The digital transformation will lead to a reorganization of the occupational world. Educational institutions play an important role in this context, as they train the future workforce. This raises the question of how vocational schools are already responding to changes in the world of work today? Does Artificial Intelligence and automation play a role and if so, which one? These and other questions are addressed in this article based on an online survey of German vocational school teachers. The survey was conducted through the European Tacle AI project.

**Keywords:** Digital transformation, vocational education and training, Artificial Intelligence, Teachers' and learners' changing roles, technology-mediated environment

### Introduction

Artificial intelligence (AI) is not a new topic, instead it has been occupying computer science since the early 1950s. The term was first coined during the Dartmouth Workshop on artificial intelligence in 1956. The topic has been particularly high on the agenda in recent years, as recent technological advances push the limits of what machines can do (McKinsey, 2018). This is particularly due to the increasing use of the Internet, the availability of data and more powerful computing and algorithms. A uniform definition of what artificial intelligence is, however, does not yet exist, since AI combines a multitude of technologies. Artificial intelligence is therefore to be understood as a kind of “umbrella term” (Southgate et al., 2019; p.17). The challenge of defining AI lies in the fact that it cannot be conclusively determined what is considered “intelligent”. Nevertheless, there are some attempts at a definition, for example the following from the German online platform for AI, which serves as a basis for definition in this paper:

*“The term AI stands for systems that exhibit behaviour commonly assumed to be human intelligence. The goal of modern AI systems (learning systems) is to enable machines, robots and software systems to independently process*



*and solve abstractly described tasks and problems without each step being programmed by humans. At the same time, the systems should also be able to adapt to changing conditions and their environment.” (Lernende Systeme, 2020)*

The official strategy paper of the European Commission (European Commission, 2018) on AI starts by proclaiming that “AI is reality”. And indeed, many of us use AI-based technologies in our daily lives: voice assistants, image analysis software, search engines, speech and face recognition systems. Most people know rather less about AI processes and technology, what data are used and how the algorithms look like. However, such knowledge is necessary to understand possible dangers and ethical challenges in the context of digital transformation. Technological change is leading to a fundamental change in the world of work: occupational profiles change, occupations disappear and other occupations emerge (Brynjolfsson & McAfee, 2014). How is the educational landscape reacting to this trend, especially in vocational training? What skills will teachers need to have in the future to prepare young students for the working world of the future? The Erasmus+ project “Tackle AI – Improving Skills and Competences of VET Teachers and Trainers in the age of Artificial Intelligence” ([tackleai.eu](http://tackleai.eu)) deals with these and other questions. Tackle AI is a two-year Erasmus+ project with partners from five European countries. It focuses on the question of which (new) competences teachers and trainers need in order to respond to the AI transformation of the professional and working world and to prepare young people for an AI-based working environment. The following is a brief overview of the influence AI has on vocational training. This is followed by the results of an online survey among German vocational school teachers.

## **Background information on Artificial Intelligence and VET**

Vocational schools face two challenges in the context of the digital transformation. First, they must prepare young people for a technology-based working world. Second, vocational schools, as educational institutions, must themselves undertake a digital transformation. Learning and teaching can be further digitalized through new technologies, and schools must discuss how to deal with this. In Germany the curricula for some apprenticeship programmes have already been adapted to changes in the world of work, e.g. the IT professions. Topics such as optimisation of digital processes and smart products, networking and automation as well as analysis of data and processes are to be taught there.

The German AI strategy (KI, 2018) states that the understanding of AI for vocational education and training needs to be promoted among young people in a new kind of way. Concrete projects in this context are the establishment of learning factories at vocational schools. These could help to improve technical skills by topics related to AI. These

Learning Factories provide a professional learning environment to allow project-based and work process-oriented learning which support social skills. However, have these ideas and the field of AI already reached vocational schools? These and other questions are dealt with in the following.

### **Study design for the survey of current and future role of artificial intelligence in vocational schools in Germany**

In June 2020, vocational school teachers in Lower Saxony and Bremen were surveyed on the topic of “artificial intelligence in vocational education and training”. The overall aim of the online survey was to get a first picture of the role artificial intelligence plays currently and for the future in vocational training in the region of Lower Saxony/ Bremen. It was of interest to find out what actually takes place at vocational schools in the context of AI as well as the individual opinions and assessments of vocational school teachers on the topic of AI in general and in vocational schools. 29 vocational schools were contacted with a request to forward the survey to the colleagues. The results presented here reflect an initial interim status and do not claim to be representative. The survey is explorative in nature, so that no generalisations can be made from the sample to the target population (vocational school teachers in Lower Saxony and Bremen). Nevertheless, the data show tendencies in how vocational school teachers perceive and evaluate AI.

### **Data collection through an online survey**

An online survey was chosen for data collection as the survey could be distributed relatively easily and simultaneously. This enabled the vocational school teachers to process the questionnaire independently of time and space (Wagner & Hering, 2014). On the other hand, there is the advantage that no interviewers are used, as is the case with telephone surveys, for example. This eliminates interviewer effects and minimizes effects of social desirability. The result can be an increased sense of privacy, which can have a positive effect on data quality. At the beginning of the survey the participants were given a definition of AI to ensure that the respondents had a relatively similar understanding of the term. The socio-demographic data were then collected. In addition to age and gender, these include questions on work experience, subjects taught and occupations for which the respondent is trained. In terms of content, the questionnaire is divided into four thematic areas. First, the general attitude towards AI was asked. The second set of topics includes questions on the integration of AI at vocational schools as (a) preparation for the AI-based working world, i.e. in the form of projects or lessons on AI and (b) as an application for learning and teaching. The third section of topics covers questions about work and occupation-relevant developments in the context of AI transformation. The final thematic section deals on the one hand with which competencies are becoming increasingly important for vocational school teachers. The areas of competence covered are based on

the European Framework for the Digital Competence of Educators (DigCompEdu). On the other hand, it is asked whether vocational school teachers consider training courses on AI to be relevant for themselves, whether they would participate and which topics would be of particular interest.

When creating the questionnaire, attention was paid to integrating both open and closed questions. The closed questions offer the advantage that quantified statements can be made about the participants and the answers are more comparable. However, closed questions require that the questionnaire creators are aware of the alternative answers. Furthermore, closed questions run the risk that the categories of answers will influence the participants' response (Franzen, 2014). Open questions, on the other hand, can be used to collect answers that do not indicate a mental direction and the respondents can express thoughts in their own words (Züll & Menold, 2014). However, evaluation is more time-consuming and comparability is reduced. The mix of open and closed questions is intended to combine the respective advantages of both in order to obtain a comprehensive picture.

### ***Descriptive evaluation of the survey results***

#### *Sociodemographic characteristics of the sample*

48 vocational school teachers aged between 30 and 63 years participated in the online survey. In the following, the percentage figures refer to this number of cases (N = 48) if no further details are given. The average age of respondents is 50 years old. Eight of those interviewed were female, 38 male and two persons had an item nonresponse, i.e. the individual question was not answered. The majority of the persons (40%) have been working as vocational school teachers for eleven to 20 years. The interviewees were able to indicate which professions they mainly train for. The open answers were coded using the classification of occupations (from 2010) and assigned to the ten occupational areas or main occupational groups (Bundesagentur für Arbeit, 2010). 60 percent of the respondents provide training for an occupation in raw material extraction, production, manufacturing. It can be seen that within this area, respondents provide training primarily for mechatronics, energy and electrical occupations as well as for mechanical and automotive engineering occupations.

#### *General attitude of vocational school teachers towards AI*

The general picture of the respondents about AI is generally positive, with almost 80 percent stating that they have a rather positive or positive image of AI. None of the individuals surveyed indicate that they have a negative image of AI. The positive image of AI is consistent across age groups, gender and work experience. For example, in each of the four age groups, the majority of respondents have a positive image of AI (Table 1). A breakdown by profession also reveals no differences in attitudes towards AI.

Table 1: General attitude towards AI by age groups

	30 -39 years	40 – 49 years	50 – 59 years	60 years or older	total
(rather) negative picture	N = 2	N = 2	N = 4	N = 0	N = 8
(rather) positive picture	N = 7	N = 4	N = 21	N = 5	N = 37
total	N = 9	N = 6	N = 25	N = 5	N = 45

Question: In the following we would like to know what your general attitude towards AI is. What is your overall image of AI?

This (rather) positive basic attitude is also reflected in the high level of agreement (62.5%) with the following statement: Artificial intelligence is good for society because it helps people to do their work or to perform their everyday tasks at home.

The statement that artificial intelligence is necessary because it can be used to do work that is too difficult or too dangerous for people is also supported by two-thirds of the respondents.

#### *AI for teaching and learning in VET*

The second set of topics asked whether the topic of AI is already being addressed, what effects AI has on the professions in the teachers' opinion, and whether curriculum adjustments would have to be made in response to these changes.

More than two-thirds of the respondents (69%) say that they themselves or their school does not have a project dealing with AI, or that they know nothing about it. One third say that an AI project exists at their school. Six of the respondents state that it is an internal school project. Nine of the respondents say that it is a project in cooperation with external partners (e.g. companies). The teachers who have not been involved in any AI project so far or who do not know of any at the school were asked whether they consider the development of AI projects to be useful in the future. 76 percent think it is useful.

The respondents were then asked to report more about the projects. It is noticeable that the spectrum of the projects is quite broad. The following topics were identified in the open answers: smart production facilities, autonomous driving, intelligent sensors in the industrial sector 4.0, deep reinforcement learning, collaborative robotics, programming of AI systems and data analysis.

The diversity of topics makes it clear how differently AI can be addressed in vocational school. While some deal with programming for character recognition, others deal with intelligent sensors in the area of Industry 4.0. Another project deals with the topic of "Deep Reinforcement Learning". Reinforcement Learning means intensified learning and describes a "process in which a learning system makes decisions on the basis of which it then acts. It uses an algorithm that learns to better assess the chances of success of the individual actions in different situations. It receives positive or negative feedback for the

selected actions. The goal of the system is to receive as much positive feedback as possible. Deep Reinforcement Learning uses artificial neural networks as models that have been successfully used in games (e.g. Go, Poker, Atari)” (Lernende Systeme, 2020).

Another vocational school teacher reports on a cooperation project with a company for autonomous driving in Hamburg. This is aimed at prospective electric mobility technicians and is intended to clarify the requirements for autonomous driving and thus enable students to make their first contact with artificial intelligence. Another teacher reports on the school-internal and cross-professional “Smart Factory”. Smart Factories are decentralized learning workshops that were established at six locations with a total of eleven vocational schools as part of the Lower Saxony project “BBS (VET school) fit for 4.0”. They are intended to give trainees in industrial-technical and commercial professions the opportunity to further their education in modern 4.0 environments. At a VET school in Wolfsburg, apprentices for automation technology and dual students have built a smart bottling plant. The industrial facilities in the neighbouring Volkswagen plant serve as a model. At the models of the Smart Factory, the students can gain practical experience in dealing with the latest industry 4.0 technologies.

In the second set of topics, vocational school teachers were also asked about the use of AI applications for teaching and learning. One third of the respondents consider the use of AI technologies in teaching to be helpful in principle. A quarter even stated that they already use learning or teaching applications based on AI. However, 90 percent of the people who have not used AI applications for learning and/or teaching so far can in principle imagine doing so. The teachers were also asked how they assess the future importance of the following AI technologies as learning applications in vocational schools over the next three years: Learning Analytics, AI-based examination systems, machine learning tools and apps, adaptive learning, intelligent and speech-based assistants and humanoid robots. The question is taken from the mmb Trendmonitor (2020), in which 60 experts from Germany, Austria and Switzerland are interviewed online every year on the topic of digital learning. The experts of the mmb Trendmonitor expect Learning Analytics and Adaptive Learning to gain importance as learning applications in the next three years (mmb Institut, 2020; p.12). Humanoid robots are considered to have the least potential. The assessments of vocational school teachers are basically in line with those of mmb Trendmonitor experts. They ascribe the highest importance to Adaptive Learning, Machine Learning Tools and Apps and Learning Analytics for the next three years.

The vocational school teachers were also asked to agree or disagree with a number of statements. Over 60 percent assume that teaching and learning will fundamentally change through the use of artificial intelligence. However, they do not think that the use of artificial intelligence will replace teachers, trainers or instructors. In the category “Other

remarks”, a teacher made the following statement on the topic of whether AI will replace teachers: “AI will not be able to replace teachers because of the empathy and social skills of teachers. It should only be seen as support. (...) otherwise humanity and social integrity will be lost”.

#### *Future effects of AI on the working and occupational world*

In the third block of questions, the teachers were asked about their assessment of future AI-induced developments in relation to the labour market and education in general. 71 percent assume that there will be neither job cuts nor job gains, but that the number of jobs will remain relatively constant. Instead, there will be changes to tasks within occupations, according to the teachers’ assessment. The teachers were also asked to indicate the extent to which they agree with the following statements. They assume that the assumption of physically demanding tasks by AI can make some occupations more attractive. At the same time, the vocational school teachers also see that action knowledge about AI is necessary for young people in order to be attractive for the labour market.

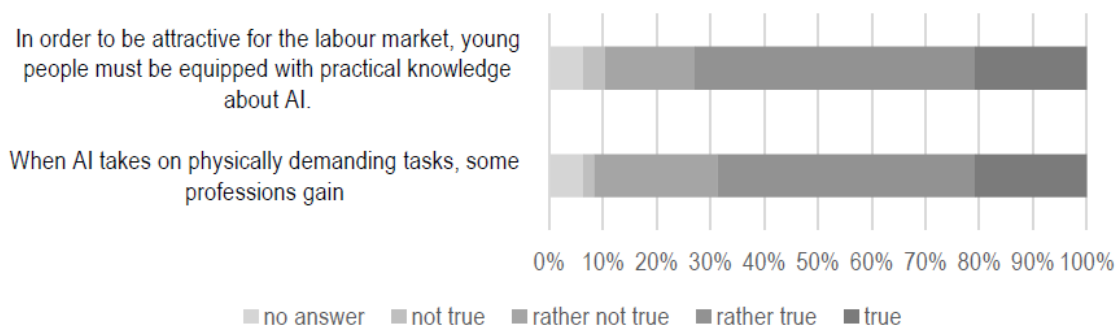


Figure 1.

Overall, the interviewees therefore see that AI changes the working and professional world and that it also has an impact on competences. The vocational school teachers were also asked whether they assume that the use of artificial intelligence influences the professions for which they themselves train. 75 percent of the respondents expect that AI will have an influence on the occupations for which they train.

#### *Teachers digital competences in the age of AI*

In the final section of questions, the teachers were asked whether they could imagine taking part in an online course entitled “Vocational school teachers fit for AI”. The vast majority (77%) would participate in such a course. The main argument against participation is lack of resources (time). The top 3 training topics that would be of interest are AI tools for teaching, AI pilot projects from other vocational schools and practical examples from industry.

The DigCompEdu framework was used to find out which digital competences will become more important for teachers in the coming years in the context of AI and vocational training (Redecker, 2017).

The DigCompEdu framework proposes 22 digital competences organised in 6 areas. The competences are divided into further levels of competence (A1, A2, B1, B2, C1, C2), so that teachers can determine their level of competence. In principle, the framework is aimed at teachers in all sectors of education and is intended to support them in the use of digital media in educational programmes. Area 1 focuses on the professional environment, i.e. the use of digital technologies by educators in professional interaction with colleagues, learners, parents and other interested parties, for their own individual professional development and for the continuous innovation of the institution and the teaching profession. Area 2 deals with the competences required to use and create digital learning resources effectively and responsibly. Area 3 is devoted to the management and orchestration of the use of digital technologies in teaching and learning. Area 4 is concerned with the collection and analysis of data relevant to learning and the provision of feedback. Area 5 focuses on the potential of digital technologies for learner-centred teaching and learning strategies. Area 6 deals with the specific pedagogical competences needed to promote digital literacy among pupils. Areas 2 to 5 represent the pedagogical-didactical core of the competence framework. According to the teachers surveyed, all areas of competence will gain in importance when AI becomes part of everyday life at vocational school. It is noticeable that in area 4 “Use of digital technologies and strategies to improve the assessment of student internal performance” and area 5 “Use of digital technologies to improve social integration and personalization of learning tasks”, more respondents assume that these competencies will remain the same or, in the opinion of some, even decline. This assessment is interesting, since it is precisely the evaluation of performance and the personalization of learning tasks that is seen as the decisive added value of AI for schools.

## **Summary and Outlook**

In summary, there are isolated AI projects in schools, but these have not yet reached the wider community and should therefore be considered pilot projects. Of the projects identified, 60 percent are carried out in cooperation with external partners. The initiation of AI projects could therefore promote cooperation between learning locations. It can also be concluded that vocational school teachers are quite open to the use of AI-based learning applications in vocational school. On the one hand, they can imagine themselves using AI-based applications. On the other hand, they expect that AI-based learning applications, such as Adaptive Learning, Machine Learning Tools and Apps and Learning Analytics will gain importance in vocational school as a whole and that teaching and learning will change

fundamentally. At the end of the survey, the respondents were able to make further comments on the topic. There were a few critical statements, e.g.

*“AI is important for the future and there will be no way around the use of AI if institutions want to remain competitive. But in vocational schools there are much more urgent problems that need to be solved. In the face of so many projects, action orientation and media mania, students today only in exceptional cases master basic cultural techniques such as meaningful reading, the simplest mathematical skills and concentrating on one thing for more than three minutes.”*

The survey was conducted within the European project Taccle AI. In the future, it is planned to conduct similar surveys in the project partner countries to compare how the topic AI and VET is approached there. There will also be a survey of companies in the region of Lower Saxony and Bremen. After all, vocational schools are only one place of learning in the dual German vocational training system. It is therefore also of interest what the companies expect for changes in the labour market in the future and what effects this will have on the qualifications required of employees.

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## ETHICAL CHALLENGES IN THE USE OF IOT IN EDUCATION: ON THE PATH TO PERSONALIZATION

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### Abstract

In the research on the ethical challenges related to the Internet of Things (IoT) and the personalisation of the learning process, four key categories have been identified: Security, Privacy, Automation, and Interaction. Based on this framework, using Constructivist Grounded Theory (CGT), we've conducted a study with twenty one actors in the field which have reflected on the advantages, risks and challenges, creating and developing theoretical solutions from technological, pedagogical, and ethical-philosophical perspectives. Coupled with the challenge of interoperability on IoT highways, the educational process generates disadvantages associated with access, use, monitoring and ownership of data, as well as standardization that falls under “profiling” rather than personalization. This leads to problems like exclusion, redundancy of the human being in education through its homogenization and determinism that leads to a loss of sense of freedom, control and choice. The consequence is surveillance associated with corporativism and the loss of the notion of the Common Good in general and in the education in particular. In this paper we discuss how IoT, algorithms and Artificial Intelligence (AI) linked to automation falls within the profiling; and whether more artisanal solutions linked to human language, communication and the relationship that enhance collaboration among multitudes, lead to a stigmergic learning enhancing a personalization of proximity. In this way we are invited to think of a symbiosis between the human being and the machine without the threat of its control, but with the openness and access in education as advantages, the expansion of interaction and communication enhanced by automated processes in pursuit of personalization, distinguishing the cost from the value of data, the value of collective data from the value of personal data among other challenges. In the paper we suggest the idea of a new social contract, whose ethical dimension necessarily rests on the value of the Common Good associated with justice, equity, equality and inclusion.

**Keywords:** Ethics, Education, Personalization, Security, Privacy, Automation and Interaction.

## **What we mean by the Internet of Things**

The Internet of Things is a physical substrate designed to transform all things into intelligent entities by removing them from the amorphous and passive dimension which naturally constitutes them. Through the interactivity allowed by IoT, it will be possible to say that the thing or object itself is, through the internet and its protocols, capable of interconnecting, creating “intelligence”, being a Smart Thing. The (artificial) intelligence of each particular thing will certainly depend of its definitions, which gives it a specific personality in the digital world. An object whose definition is to monitor a person, use the data that collect learning with the person to whom it is intended or to whom it belongs, serving the purpose of the interaction between the machine and the human being.

The addressability in the immaterial world of a physical object, is capable of giving each object a virtual identity that allows it to operate in different spaces and to interconnect and learn from others similar to it (interoperability) due to its semantic dimension. With the use of digital databases (Big Data) and the interoperability of these same data, objects (Smart Objects / Smart Things) become, for the human being, an embedded intelligence (an extension of the human body or the increment of a capacity, for example). Since each object is virtually addressable, interoperability gives each object the ability to connect to different other objects making it ubiquitous.

Consequently, “the Internet of Things allows people and things to be connected Anytime, Anyplace, with Anything and Anyone, ideally using Any path/network and Any service.”(Perera et al., 2013). Leaving the uniformity and the unidirectionality, the instruments that people use began to have different uses in relation to the initial ones and the human being step into the register of the intermediated connection. In addition to the connection, the IoT allows interconnection and interoperability between data. This is the small (but giant) step that technology lacked so that its use would become a challenge.

## **Personalization**

### ***The idea of personalization***

Understood both as a characteristic that can be applied to objects that are interconnect in the network from the physical substrate that the IoT provides to them, as well as the probable promise of adaptation to the individual characteristics of each entity that uses these same objects now removed from obscurity, the personalization brings enormous advantages, but also profound risks whose identification, reflection and ethical re-dimensioning may distance dystopias. IoT is a network of relationships of objects that

are no longer simple objects but also become subjects with information and with the ability to cross data among themselves about subjects who are people (and who come to be seen as objects).

Personalization in the field of objects, is the possibility that each of the objects (produced in series) has its own identity that makes it different from all others, capable of control, obtain, give and even manipulate data (data are behaviours, are people's life) about other objects (capable of representing subjects – people) and about other subjects (that are, effectively, people). The promise of personalization capable of ensuring that each subject corresponds to their needs is real and is possible. There are several areas that are already moving in this direction: from agriculture to industry, from commerce to medicine to wellness centres, from smart watch to smart cloth, from smart cities to smart cars, from museums to libraries and so many other goods and services.

### ***Personalization in Education: technological, pedagogical and ethical aspects***

From 2013 until 2020, the idea of personalization gained increasingly more attention as it went through different conceptions and relations. This evolution started with Buchem and Pérez-Sanagustín who related the concepts of Smart Cities, Personal Learning Environments (PLE) and Smart Citizens (Buchem & Pérez-Sanagustín, 2013); The K12 NMC Report refers to Learning Analytics (LA) crossed with Big Data in search of personalization (Johnson et al., 2013); The Future of IoTs in Education refers to an inclusive education of children and young people with neurodiversity talking about the access to resources globally (Advanced MP Technology Inc., 2013). The following year saw important advances in the concept of personalization, due to the combination of technologies such as Bring Your Own Device (BYOD), LA, Wearable Technology (WT) and IoT (Johnson et al., 2014).

In 2015 the notion of ubiquitous and integrated learning in the circumstances that the individual goes through, appears for the first time, referring to Hypersituating as “(...) the ability to amplify knowledge based on the user's location. In other words, learners that carry connected devices with them can benefit from a host of interdisciplinary information that is pushed to them from their surroundings. For instance, a learner exploring a city with a rich historical past can explore their environment through an architectural, political, or biological lens, depending on how the surroundings are equipped. IoT can also create an environment where learners are informed by crowd sourced contributions and observations from the community via networked objects.” (Johnson et al., 2015). In this year there are also examples related to neurosensors capable of measuring students' brain waves while they learn, allowing teacher intervention in cases of greatest need (Meyers, 2015).

Mutating again in the following year, the term evolved to the new concept of Wearable Technology (Adams Becker et al., 2016; Freeman et al., 2016), with automation starting to gain ground. It is also at this time that Robotics, AI and Machine Learning begin to be noticed.

But in 2017, the term focused on the generation of data from the students' devices and at the same time it refers to the ethical implications that this data collection can have in relation to security, transparency and privacy (Adams Becker et al., 2017).

The 2018 Horizon Report does not mention IoT, but identifies analytical technologies as an important step towards customization, namely adaptive learning and AI – as an extractive technology (Adams Becker et al., 2018). In 2019, however, the trends continue. The associated ethical issues are mentioned. It still refers to blockchain as a distributed technology, but with a very long time of adoption when it comes to education. (Alexander et al., 2019)

Finally, in 2020 there is no mention to the IoT. Nevertheless, ethical issues begin to emerge (Brown et al., 2020) and are essentially the questions inherent to privacy those that gain ground.

## **Ethical Challenges on the Internet of Things**

The use of Constructivist Grounded Theory made it possible to build a framework based on the different data presented. The information that preceded this point resulted from theoretical research carried out from different places of information, including the reference literature; the information that follows this point is in accordance with the data collected from twenty-one synchronous interviews.

### ***Security***

The vulnerability of the infrastructures is the first of the challenges because it can be intentionally exploited leading to phenomena of people exchange, hacking, piracy, badness or errors not only of the devices but also of the information network (sensitive information) that represents people and that circulates with a very high level of exposure.

Therefore, security is not only related to the data that represent people, but of the people themselves that can be manipulated from the outside. In an immersive environment whose complexity arises from the connection between AI technologies and IoT technologies, the monitoring of students in real time generates a set of personal, sensitive data, putting at risk the person's physical and personal security, since the data coming from images can be manipulated or stolen.

### ***Privacy***

Privacy exists only if there is personal data and the data is only valuable because it is private, personal and intimate (privacy - personalization). Without any costs, it is necessary to realize that people are the product for companies.

In education, how much students want to expose about themselves is related to privacy (it concerns to each person's option), but security concerns the fact that what, for example, students do not want to show, is safe. Besides that the issues of privacy intersect with those of personalization since the tendency of AI will be to connect people to paths, with no possibility of being selective in their privacy.

It is also important to differentiate between collective data (Big Data) and personal data (sensitive). The value of the data and the privacy of the data must coexist peacefully. There is data with personal value and there is data with collective value, although sometimes the borders are not well defined. The information belongs to the person and, therefore, society should give due value to that information (not to be usurped, stolen, sold as belonging to other people, companies or corporations) for the collective good that it can generate - the rarer and scarcer it is information, the more value it has.

### ***Automation***

With the help of automation it is possible to reach the individual, find the students' potential, help the student in his learning path (what he has to do, as well as his progress). To give an understanding of the struggles that students have when they have a problem or the good things they are doing, while education is massified, the teacher is better aware of who and where he has to help.

The central point is the agency (having control over operations), with an emphasis on choices and decisions. Sometimes control escapes to the human being, so it's important not to leave human freedom tied to recurrence schemes, otherwise, freedom, choice and decision are conditioned, not to say even determined. For example, BCI devices are potential objects of personalization (creation or extension of capabilities), but the intrusion of rationality when used, for example to evaluate decision making, is a risk.

### ***Interaction***

What changes is the way of interacting with the use of analytical models to assist the teacher, whether in the assessment, re-evaluation or adjustment of the student's curriculum plan. With the introduction of AI and its muscular use, data surveillance can completely change the interaction between all, becoming deterministic the educational process.

In view of a personalized education model in which the student's profile is the core of the educational process, profiling determines the interactive process of teaching and learning, blocking the essence of education and the question that relates automation with interaction leading to the question the educational process to determinism.

## **Thinking about solutions**

Based on the interviewees' words, several possibilities were found to consider solutions in relation to the ethical challenges posed by the categories identified above. The following is a list of ideas that enhance the finding of solutions:

- It's important to think about security issues a priori, which implies the creation of technology by multidisciplinary teams at the level of design (diversity of people, experiences, trends ...);
- Make a cultural programming of the intelligent algorithm to include ethical, moral and legal mechanisms, starting with limiters (the notion of safety) which leads to the notion of cyber social contract;
- Having distributed tools as blockchain;
- Anonymizing people to ensure that who accesses to the content will have to be who is authorized, giving good use to what they access (but it will be ethical for only a few to access to some resources?);
- Raising awareness of the definition of policies related to the use of IoT which will imply:
  - create a frame of reference and raise awareness of the responsibility for security definitions;
  - each institution should have a code of conduct for good practices leading to self-regulation by
  - the institution itself;
  - scrutinize the conduct of companies and institutions so that there is transparency in institutional relations - it is important to know with whom it speaks.
  - ensure the level of reliability of the systems, since it is important to ensure that the systems are available, but only those who should have access to them;
  - it is necessary to beware about issues related to the monitoring and the use of data: the data should only be used for the purpose that it serves, and should be destroyed when it is no longer in use.
  - it is also to beware about intellectual property issues.
  - It's important to teach people how to safeguard their accounts and profiles.

- Make IoT devices secure:
  - restrict its use from the outside;
  - create trusting relationships between users and the institution;
  - making people aware of the dangers because we depend on machines and programs that we do not understand, which shows the need of digital literacy associated with critical thinking;
  - guarantee identity in a relationship between sender, receiver and channel (machines or human beings); guarantee the identity of the content as well as the absence of interference (natural or from the intervention of third parties) because the quality of the information is linked to its veracity (being from a reliable source), correctness (accuracy), usefulness and objectivity (and not to selection of partial information). In education, these references are central.

### **On the path to Personalization in Education**

Privacy and Interaction are the categories that challenge us as people; Security and Automation are much more linked to technological and institutional issues.

According to the different perspectives of the interviewees in education there are at least two paths: the first one is the IoT way, which means a path of automation, algorithms and AI (based on collected data). With it will be able to address things to types of people creating stereotyped profiles at the risk of homogenization. This is not personalization; is profiling. The other is the Internet of People anchored in large-scale collaboration and linked to human language (which is on the side of communication and relationship) that enhances collaboration between crowds whose paradigm originates from the collaborative construction at the image of Wikipedia. This is stigmergic learning with the use of IoT technologies will allow an Internet of Everything (IoE) anchored in the notion of the Common Good.

In a path whose algorithms and AI are disconnected from people, notions such as: surveillance capitalism (based on totalitarian governance decisions or peripheral to the common good); determinism (inherent to the educational process); profiling (which is born based on standards of profiles). They lead to the loss of the human factor in education, the risk of losing the sense of freedom as well as human agency, control and choice. A society and an educational system whose foundation put aside the improvement, are condemned to be dominated either by a totalitarian government, or by corporations, companies and institutions whose race to AIs is based on an ethics of good intentions, but it will generate harmful consequences if it does not contain values linked to the Common Good, justice, equity and inclusion, which means an ethics of care. In this sense it's important: to create a new social contract based on the idea of technological safety (a



limiter of automatisms in terms of security and privacy) and based on the value of the data (different from the cost); distinguish data with collective value and data with personal value; accomplish the symbiosis between human being and machine, in the clear human agency; attend to the scrutiny of conduct codes of institutions and companies and the good institutional practices; attend to an ethical education based on meta values capable of creating multidisciplinary teams (because the technological design must be universal) and people and citizens whose vision is not limited to the specialty of what is the object of study, but that are capable of shared responsibilities and fair and equitable users of common sense.

The construction of a collective intelligence shared and co-built with an Internet of Everything and with the help of different IAs (external and / or built-in), whose functionality is to solve problems (relieve the effort in certain tasks, namely uncomfortable and repetitive, increase or expand capabilities or even increase deficient capabilities) and whose real communication is between and with people, will allow the growth of stigmergic learning and more evolved societies from the human point of view (the humanity point of view). This is possible by the replacement of technology essence in itself through education and by the understanding that its repercussions are too wide and technology couldn't be seen or used as neutral; are essential for the replacement of humanity in people, at the same time that it will imply the symbiosis between them (which seems like an antagonism, but it is not, in fact). This will certainly bring about a new epistemological vision based on complexity and diversity, which brings ethical challenges that have not yet been explored.

## **Conclusions and future research**

In this paper we've explored a number of questions whose answer, related to the construction of a more just, egalitarian and equitable society (or its opposite), depends from the relation established between ethical and governance options. A relation which intersects with political, financial and social development dimensions.

The literature review allowed us to conclude that personalization in education through the use of IoT is clearly possible and desirable. But, this will not be the best scenario until the AI-powered IoT mechanisms are fully optimized in what respects human development. The experts which were interviewed expressed a similar position. They've considered machine-assisted personalization of learning experiences to uphold great potential to improve the quality of education. However, profiling as an educational achievement based exclusively on IoT mechanisms powered by AI without ethics. The risks are high and real. Education can become too homogenous and deterministic. Consequently, learners face a real threat of being subject to constant monitoring. The misuse of the enormous amount of data generated jeopardizes several critical dimensions of their life experience (privacy,

security and interaction) because of the potential capacity of automation to take control and decision. This threat however is not specific of education and learners. It represents a fundamental challenge of contemporary societies and individuals.

As a wonderful new world opens up at an unimaginable speed, promising us exciting new scenarios, this process is also takings by storm, leaving no time for reflection and to mature compromises. However, it's very important for the educational field, for all stakeholders involved, to reason about the impacts and consequences of this rapid and disruptive transformation. It is more urgent than ever important to think about technological design, cost and ownership. It is fundamental to think of personalization and commoditization as educational categories; to build a social and ethical matrix, as well as an ethical framework which will be able to guide institutions and inform quality practice.

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## **A PEDAGOGICAL MODEL TO SCALE UP EFFECTIVE TEACHER PROFESSIONAL DEVELOPMENT – FINDINGS FROM THE TEACHER ACADEMY INITIATIVE OF THE EUROPEAN COMMISSION**

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### **Abstract**

Teachers continue to experience change in education policy, societal trends, and cultural shifts in pedagogical thought, which all require a continual adaptation and innovation of their own practice. Effective support and opportunities for teachers to develop and apply their competences is crucial for maintaining both motivation and high standards in the school education profession. However, many teachers across Europe claim to struggle to have access to effective forms of Continued Professional Development (CPD) coupled with the numerous demands already made on their work. Onsite (face to face) courses with opportunities for peer learning remain popular but are not time or financially cost-effective in reaching a large number of teachers. By exploring the pedagogical model of the online courses of the European Commission's 'Teacher Academy', this article discusses how an effective, collaborative approach to online CPD can be developed as a way of addressing both teacher and school education system needs.

**Keywords:** e-learning, teacher, CPD, peer-learning, pedagogy, MOOCs

### **Introduction**

Evidence from the OECD Teaching and Learning International Survey (OECD, 2019) shows that many teachers in OECD countries struggle to access and benefit from continuous professional development (CPD), with very few, if any, improvements registered over the last decade (OECD, 2009; 2014). The question beckons, what needs to

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change for teachers to access the CPD they require to address the challenges they face in their classrooms.

As a direct offer to teachers and school leaders across Europe, in 2016 the European Commission launched the Teacher Academy (TA) as part of the School Education Gateway platform ([www.schooleducationgateway.eu](http://www.schooleducationgateway.eu)), offering Massive Open Online Courses (MOOCs) for teachers. While targeting teachers directly, the Teacher Academy, was also designed to develop an understanding of how policy makers and teacher trainers can address some of the systemic challenges faced by teacher CPD provision in Europe.

For this purpose, this article explores the potential of the Teacher Academy initiative as a form of online CPD to address not only the barriers reported by teachers in accessing relevant CPD, but also allows for easy and cost-effective scalability, asking:

22. To what extent are teacher CPD MOOCs an effective CPD format that results in changes to teachers' practices and student outcomes?
23. To what extent are teacher CPD MOOCs a scalable mechanism that allow reach-out to teachers in need of more relevant CPD?
24. What instructional design features should teacher CPD MOOCs incorporate to engage teachers in an impactful way?

## **Online Teacher CPD – An overview of recent literature**

Online CPD formats are inherently more flexible than onsite CPD, usually offering flexibility in when and where it is accessed, allowing teachers to benefit from it at times when it does not create conflicts with their usual work schedule, and without the costs and inconvenience of travel. Furthermore, teachers can access a wider selection of CPD, offered at regional, national or even international level, given that their participation does not depend on the geographic location of the offer.

### ***What is effective online teacher CPD?***

There is extensive research on what constitutes effective teacher CPD with general agreement that it should cover specific subject matter, allows engagement over time, and offers interactive experiences (Parsons et al., 2019). Furthermore “Successful [TPD] programmes [...] encourage the development of teachers' learning communities. A key strategy involves finding ways for teachers to share their expertise and experience systematically.” (Schleicher, 2016; p.91). Similarly, Laurillard (Laurillard, 2016) argues that “unless teachers are the ‘prime actors’ in their own development, it will be impossible for them to keep up with the rapid changes in the environment, political, cultural,

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economic and, especially, technological.” (p.3). Darling-Hammond et al. (2017) conducted a review of 35 methodologically rigorous studies that have demonstrated a positive link between teacher CPD and teaching practices and student outcomes. Based on this review they identify the following 7 elements of effective CPD:

25. Content-focused,
26. Incorporates active learning,
27. Supports teacher collaboration,
28. Offers models of effective practice,
29. Provides coaching support,
30. Provides time for reflection and feedback,
31. Sustained duration.

Effective CPD according to Darling-Hammond et al. should incorporate most of these 7 elements.

None of the elements mentioned above are restricted to face-to-face scenarios of CPD, so they should equally apply to online CPD. However, the literature does identify particular elements relevant for online CPD contexts to be effective for teachers, drawing in parts from the literature about online adult learning more generally. Powell and Bodur (2019) identify six design and implementation features which online teacher CPD should integrate, based on a review of the literature focussing on online adult learning as well as online teacher CPD: (a) relevancy of addressing teachers’ learning needs, (b) usefulness to solve problems regarding teaching practice, (c) interaction and collaboration to generate engagement, (d) authentic tasks and activities which reflect teacher practice, (e) reflection to help contextualize new information, (f) understanding of the “intersectionality of technology, content, pedagogy, and learners”.

### **Teacher CPD MOOCs**

MOOCs have become a common online learning format since the early 2010s. While MOOCs originally were meant to offer free education to those most in need, it quickly transpired that those making most use of MOOCs were highly educated professionals (Ho et al., 2014). Rather than using MOOCs as a format for undergraduate education as originally envisioned, they were quickly becoming a format for professional development.

Interestingly, many participants of MOOCs, regardless of the MOOC topic, are teachers. A large-scale study covering 68 MOOCs from Harvard and MIT revealed that almost 39% of those enrolled identified as current or previous teachers (Ho et al., 2015). Similar results

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were obtained in Europe where 10-25% of all learners on non-teacher PD MOOCs were teachers (Castaño-Muñoz, Kalz, Kreijns, & Punie, 2018). More so, a survey of 11 MIT MOOCs showed that despite only 4.5% of enrolees being teachers 22.4% of all discussion forum comments were made by teachers (Seaton, Coleman, Davies, & Chuang, 2015) suggesting that teachers actively engaged and contributed to the course communities established as part of the MOOCs.

While there is an increasing number of teacher CPD MOOCs on general MOOC platforms (such as Coursera, Edx, Futurelearn), as well as MOOC platforms focussing specifically on teacher CPD (such as Teacher Academy, European Schoolnet Academy, INTEF MOOCs, MOOC-Eds), research focussing on teacher CPD MOOCs is scarce, with no literature so far examining systematically their effectiveness in achieving changes to teachers' practices or student outcomes.

Fyle (2013) was among the first to address the topic by evaluating the appropriateness of MOOCs for different types of teacher education. He concludes that MOOCs would only be an appropriate format for certain types of teacher education and more useful for experienced teachers than those at the start of their career. Furthermore, he portends that MOOC designs suitable for teacher CPD would have to incorporate “sophisticated online forums and other technology-oriented social structures and features that would support effective forms of socialconstructivist learning” (Fyle, 2013; p.6).

Jobe et al. (2014) addressed the topic indirectly with a concept paper exploring the potential of using general MOOCs for teacher professional development, including considerations about MOOC design for teacher CPD. Their conclusion suggests that there is great potential for MOOCs as teacher CPD as long as MOOCs are recognised, validated, and accredited by teacher professional development providers and they should be designed with a focus on collaboration and connections between peers, more along the lines of the Connectivist MOOC (cMOOC) variant than the Transmissive MOOC (xMOOC) variant.

Koutsodimou and Jimoyiannis (2015) report positive findings from offering a teacher CPD MOOC in Greece, achieving a much higher completion rate than other MOOCs as well as highly positive feedback from teachers about their participation and impact on professional practice. Their investigation also focussed on specific design elements of their MOOC, concluding that a balance between structure (following the xMOOC approach) and openness (following the cMOOC approach) is required to enhance the outcomes of MOOCs for teacher CPD.

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Laurillard (2016) investigated whether MOOCs could function as co-learning models of teacher CPD, particularly focussing on their applicability in emerging economies. Her findings – based on the results of a teacher CPD MOOC addressing the use of ICT in primary education – indicate that it is possible to use MOOCs effectively as teacher CPD as the MOOC format “fits well with the objective of supporting effective co-learning for professionals, who appreciate this form of high-quality learning, value each other’s experience and knowledge and are willing to share their experiences to learn together” (Laurillard, 2016; p.13).

Castaño-Muñoz et al. (2018) looked at the profile of participants of teacher CPD MOOCs offered by the Spanish Ministry of Education, finding that MOOCs have become an alternative channel for teacher CPD in Spain but remain in their infancy with significant parts of the teacher population not benefitting from their offer. They conclude that awareness needs to be raised in particular amongst female primary school teacher and that formal recognition could significantly bolster the standing of MOOCs.

Misra (2018) offers the most comprehensive summary on the topic of MOOCs for teacher CPD so far, synthesising not just research on the topic but also blog posts and newspaper articles. He concludes that there is substantial untapped potential for using MOOCs as teacher CPD and suggests six actions that would allow a wider use in the teaching profession.

**The Teacher Academy – How an effective, collaborative approach to online CPD was designed**

The Teacher Academy offers MOOCs for teachers that are designed around 6 specific pedagogical principles which to a significant degree correspond with the features identified in the literature about effective online teacher CPD and in particular teacher CPD MOOCs:

32. *Facilitating peer exchange*: a sense of European co-design is cultivated in the courses which supports teachers to respect ownership and expertise of participants and facilitates innovation from a process of mutual curiosity and collective reflections.
33. *Community building*: TA courses purposefully integrate activities which do not necessarily focus on the course topic but only on developing a trusting and supportive environment – similar to ice-breakers or the opportunity for informal exchanges during a coffee break as part of an onsite workshop.
34. *Peer review*: assessment and validation of learning on TA courses are provided in the context of peer review activities between teachers. Teachers engage in a process of peer review for their main course work that supports learning about learning,



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learning about assessment, builds community, and validates and assesses their course work.

35. *Content as trigger*: TA courses contain varied content such as project and lesson observation videos, and teacher and expert interviews, as well as contributions from participants. Content is not primarily used as a tool of knowledge transmission, as would be the case in a more traditional MOOC, but rather as a trigger for reflection, sharing and exchange by participants.
36. *Flexibility*: TA courses try to minimise the restrictions set on course participants in regard to a course schedule. There is only one deadline, allowing teachers to move through the course to a certain degree at their own pace. All obligatory course activities are asynchronous and teachers are free to drop-in and -out of the courses, just focussing on specific modules.
37. *Facilitating transfer to practice*: A core feature of all TA courses is that they require participants to transfer their learning into a concrete course output, such as a lesson plan, that allows for easy implementation in their own classroom or school. Through the creation of context specific course outputs participants have the opportunity to reflect on what they have learnt, and to consider it and adapt as necessary for use in their own setting.

**To what extent are teacher CPD MOOCs an effective teacher CPD format that results in changes to teachers' practices?**

Evidence from the Teacher Academy shows that teacher CPD MOOCs have the potential to be an effective format for teachers. Teachers participating in TA courses have consistently reported over the last three years that they have already implemented elements introduced on TA courses in their practice, with more than 95% confirming this in the TA course evaluation surveys. All data in this and the following sections are based on the results of the pre- and post-course surveys administered by the TA as part of its courses. Participation to these surveys is optional for the participants and entirely anonymous. The respondents therefore do not fully represent the entire course participant cohorts. The data presented mostly originates from the summary evaluation report of 2018 with  $n = 3360$  for the pre-course surveys (53% of the total number of users starting a course) and  $n = 764$  for the post-course surveys (28% of the total number of users completing a course). Qualitative feedback from teachers further confirms the potential for impacting teachers' practice and perceptions.

Of course, this does not provide evidence as to the actual impact of participating in a TA course nor the effectiveness of CPD MOOCs in general. The evidence is limited to a small

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subset of the course participants – those that have successfully completed a course and decide to complete the evaluation survey. Furthermore, the findings are based on self-reported impact. We do not know to what extent teachers actually change their practice in the classroom after participating in a TA course nor to what extent any such change would be sustainable over a longer period of time. And there is no evidence available that could claim that TA courses have any impact on student outcomes.

Regardless of these limitations, the available data and observations from the TA courses are in line with the tentative findings of the existing literature that indicate a potential for teacher CPD MOOCs. We therefore might say that there is an increasing amount of evidence to suggest that teacher CPD MOOCs can be an effective teacher CPD format.

**To what extent are teacher CPD MOOCs a scalable mechanism that allow reach-out to teachers in need of more relevant CPD?**

MOOCs by definition are scalable and compared to onsite courses or closed online courses TA course numbers are high, with course enrolments of 1000-4000 users, a starting percentage of 50-70% (of those enrolled) and a completion rate of 25-45% (of those started). In that regard they can be considered a good mechanism to increase the offer of CPD to teachers. However, in order to benefit from MOOCs, teachers require not only digital competence but also self-regulated learning competence and in case of the TA courses English language competence. This makes MOOCs not the most accessible CPD format which requires a certain skill set and experience in order to benefit from. This is confirmed by the profile of the majority of teachers participating on TA courses – experienced teachers with on average 16-20 years of teaching behind them and 76% already having experience of participating in online CPD.

These results also correspond with the findings of Fyle who suggests that MOOCs are more suitable for experienced teachers (Fyle, 2013). And to a certain extent it also follows the findings of Castaño-Muñoz et al. who report that teachers of ages 40-49 were overrepresented in Spanish teacher CPD MOOCs, indicating that they already had substantial teaching experience (2018). Furthermore, Castaño-Muñoz et al. find that teachers participating in Spanish teacher CPD MOOCs had a lower need for training in ICT skills than the overall Spanish teacher population, suggesting that MOOCs are less suited to those with lower ICT skills or digital competence overall.

While teacher CPD MOOCs can be a mechanism to make more CPD available to teachers, they cannot be the only solution to address the need for more CPD from teachers. More needs to be done to make MOOCs more accessible to all teacher profiles while at the same

time it is necessary to ensure teachers competences are developed so as to be able to benefit from CPD MOOCs and other online CPD formats. Blended approaches which make use of the online provision of a CPD MOOC with an onsite support infrastructure or workshop programme could be a way to support and reach more teachers.

### **What instructional design features should teacher CPD MOOCs incorporate to engage teachers in an impactful way?**

While it has not been possible to determine the impact of the separate components of the TA instructional design, quantitative and qualitative data from course participants suggests that the design succeeds in creating a flexible learning environment which stimulates reflection, sharing of experience, discussion and transfer to practice.

99% of respondents to the course evaluation surveys rate the structure of courses positively. Views on the video content, the main course activity of a course output with subsequent peer review, and the sharing of ideas and reflections as being useful for professional learning all receive above 90% positive ratings. Also reported by over 90% of participants by the time they complete the evaluation survey is that they have already implemented some elements from the course in their professional practice; they will use the tools, ideas and examples presented on the course in their everyday teaching practice; and that they have gained practical ideas on how they can improve their professional practice.

These findings correspond to those of Koutsodimou and Jimoyiannis who also received highly positive feedback from the course participants of their MOOC which was designed in a similar way to the TA courses (2015). The TA instructional design also follows to a significant extent their recommendation of a compromise between connectivist (cMOOC) and transmissive (xMOOC) design features. While focussing on establishing connections between participants, TA courses nevertheless operate from a centralised learning platform that is designed around course content.

71% of respondents report that they remain in contact with other course participants after the conclusion of the course, which also suggests that some form of meaningful community building is taking place with useful connections between participants being created, consistent with Laurillard's findings on the usefulness of MOOC environments for professional co-learning (2016). Furthermore, the TA course design through its use of web 2.0 tools such as Tricider or Padlet as well as its strategic use of social media and chat environments, implements to a certain extent the "technology-oriented social structures and features that would support effective forms of social-constructivist learning" as advocated by Fyle (2013; p.6).

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While we cannot conclude anything about the general teacher population from the results of the TA course evaluation surveys, data from these surveys show on the one hand a strong approval for the instructional design used and on the other hand that participants are reporting an impact from their course participation. Accordingly, we can say that for those that successfully participate in the TA courses the instructional design implemented seems to work very well.

## **Conclusions**

Finding ways how to offer more support to teachers is paramount for addressing some of the main challenges faced by our education systems today. Continuous professional development is recognised as way to effectively support teachers. This paper has therefore explored the potential of MOOCs as a mechanism to reduce the barriers teachers face in accessing relevant CPD and at the same time scaling up the offer of CPD in an effective and efficient way.

By means of outlining the experiences and evaluation data of the TA courses and surveying the available literature, the paper has contributed insights and data to the still limited literature on the topic of teacher CPD MOOCs. It is clear from the findings that MOOCs have significant potential as an effective CPD format that allows for a degree of scalability. The instructional design of the TA courses shows that MOOCs can function along the principles of effective online CPD as defined in the literature and feedback data from participants suggests that the instructional design is highly appreciated by teachers and leads to changes in teachers' practice.

However, scalability, while possible, remains limited when using the instructional design presented. Teachers' need for digital competence and self-regulated learning competence, as well as English language competence in the case of the TA, in order to gain value from CPD MOOCs, means that there will be many teachers who are left out, not yet in a position to benefit from this CPD format.

Furthermore, the findings presented in the available literature and in this paper are not representative and do not offer a systematic investigation into the effectiveness of CPD MOOCs generally. More, and more systematic and longer-term research addressing the research questions in this paper is therefore required.

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## EVALUATION OF THE PEDAGOGICAL MODEL USED IN VIRTUAL REALITY SIMULATIONS FOR TRAINING PORTUGUESE FIREFIGHTERS

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### Abstract

This paper details the pedagogical model used in virtual reality simulations for training Portuguese fire officers in emergency operations management and the evaluation of students about the implementation of the model throughout the training courses. The data of this quantitative study were collected over two years (2018-2019) and involved the participation of 89 fire officers from all over the country, who attended 12 training courses delivered at the Portuguese National Fire Service School (Escola Nacional de Bombeiros). Each course included seven to eight students, all experienced incident commanders with at least five years of service in the role. Every student played as incident commander in two different virtual reality training scenarios and their performance was assessed using a standardized evaluation tool. Students evaluated the pedagogical model implementation in virtual reality simulations through a questionnaire applied at the end of each course. The study's conclusions point out that most students consider the pedagogical model successfully implemented.

**Keywords:** Firefighters, training, virtual reality simulation, competencies, pedagogical model

### Introduction

The current importance given to competencies challenges the training systems to introduce a change in teaching practices, resulting from the transfer of content-based learning to action-based learning. The training focused on developing competencies should involve simulation of problem situations specific to each professional activity, preparing students to act in the real context of work (Lima, 2005). To assess whether students have acquired the required level of competencies it is not enough to answer a written test, students must prove in practice what they know and can do through the application of knowledge in simulated or authentic work situations.

Simulations can take many forms and be considered as a set of techniques and technologies, from verbal role play to virtual worlds (Keskitalo, 2015). Virtual reality simulation in firefighters' training allows experimental learning and complements more traditional learning strategies, including reading materials, case studies and live exercises with real fire (Lauder, Lamb, Olde, & Link, 2015). Simulations provide a learning opportunity that is both immersive and experiential (Aggarwal et al., 2010).

The use of virtual reality simulation in training tends to be dominated by the technological perspective, placing on a secondary level the pedagogical dimension that is intrinsic to any teaching and learning process. The training course used in this study follows the course' model developed by Reis (2018) for virtual reality simulation in the training of firefighters applying a pedagogical model established for health care education and adapted to this target audience.

This study aims to evaluate the students' perception of the implementation of the pedagogical model used in virtual reality simulations in a refresher training course for incident commanders.

This research is integrated in the Portuguese R & D unit 4372/FCT Laboratory of Distance Education & eLearning (LE@D), Universidade Aberta, financed by Foundation for Science and Technology.

## **Virtual Reality Simulation**

Simulators based on virtual reality systems have been used to train professionals in different sectors of activity for decades, namely in the aeronautics (Blow, 2012), medicine (Ravert, 2002; Gomoll, Pappas, Forsythe, & Warner, 2008), nursing (Hovancsek, 2007; Decker, Sportsman, Puetz, & Billings, 2008) and in the military area (Christ, 2006). Several studies refer to the use of virtual reality simulation in the training of firefighters (Bliss, Tidwell, & Guest, 1997; Hall, 2010; Bayouth, 2011; Gillespie, 2013) and research related to firefighters (Cohen-Hatton & Honey, 2015).

In some European countries, simulations in virtual reality are used for the training and assessment of fire officers who perform incident command roles at the tactical and strategic levels of operations management. Simulations can be interrupted, controlled, repeated, and allow firefighters to prepare for situations that are not always possible to simulate under real conditions (Lauder, Lamb, Olde, & Link, 2015).

The main advantages of virtual reality simulation compared to live exercises are cost-effectiveness, flexibility and the ability to create large-scale events. Virtual reality is less expensive because it requires less staff, less equipment and eliminates the need to create



physical environments for training. It is flexible because trainers can easily build a huge variety of scenarios, choosing and combining the different environments and objects available in a library. But most importantly, the simulation software allows trainers to create events in a virtual environment that would be extremely difficult to recreate in a live exercise (Boosman, Lamb, & Verhoef, 2015).

## **Pedagogical Model**

Firefighters' training should be based on pedagogical practices appropriate to the high technical complexity and the strong practical element of rescue activities. The training focuses on learning motor tasks, handling and using equipment, performing manoeuvres and exercises, usually using simulation to recreate the conditions that firefighters must face in real emergency situations.

Keskitalo (2015) developed a pedagogical model for education using simulation, based on several studies carried out on virtual reality and simulation in health care (Keskitalo, 2011; 2012; Keskitalo, Ruokamo, & Gaba, 2014). The pedagogical model is used for education of health professionals, using "task-trainer" models, high-fidelity mannequins and other medical simulators, including virtual reality simulators.

The model consists of six phases and defines for each phase the activities carried out by facilitators and students during the simulations:

38. Pre-activities – The tasks of the facilitators at this phase include designing the teaching process and the learning environment based on the specific objectives and characteristics of the students. The students' activities involve familiarization with the subject matter, including pre-study tasks, readings or theoretical classes.
39. Introduction – The facilitators present the course topic and the learning objectives. The simulation concept applied in the course is explained, including its advantages and disadvantages. In this phase, students should activate previous knowledge and experiences that serve as a basis for new knowledge. Previous knowledge can be activated through group discussion and sharing of experiences, construction of concept maps, among other activities.
40. Simulator and scenario briefing – This is the phase where the facilitators present the learning environment and the scenario. This phase should include a demonstration and practical exercises using the technology. The facilitators explain the objectives of the simulation exercise, the roles of the participants and the rules. At the end of this phase, students must be familiar with the virtual environment and understand what is expected of them so that they can assume their roles and get involved in the exercise. It is important they have learned to use the simulator.

41. Scenarios – It is the main phase of the learning experience in which students participate in the simulation. At this stage it is important for the facilitators to explicitly indicate when the scenario starts and ends. The facilitators should promote an emotionally safe environment in which students are not afraid to expose their difficulties or lack of skills, so that they can be actively involved in the learning experience.
42. Debriefing – In the debriefing phase, the facilitators encourage students to carry out an analysis of the experience in order to improve their learning and future performance. Students should carry out an exercise of review and reflection on the learning process, the identification of their gaps in terms of knowledge, as well as the identification of new learning objectives. The facilitators should provide individualized feedback and emotional support to students. At this stage it is also important to compare the simulation exercise with the real world so that students can understand the differences and understand how the knowledge and skills they have acquired can be affected by the simulation.
43. Post-activities – In this phase the facilitators proceed to a critical evaluation of the teaching-learning process, considering the facilitation process and the students' activities. They must determine whether the learning objectives have been achieved in order to develop their skills as facilitators. From the students' perspective post-activities should correspond to the opportunity to test new knowledge and skills in a new setting or in the real world.

In the case of a course that includes more than one training scenario, some of the phases occur only once (pre-activities, introduction, simulator and scenario briefings and post-activities), while other phases (scenarios and debriefing) occur as many times as the number of scenarios performed (Keskitalo, 2015).

Although the pedagogical model was developed for the health area, it is flexible enough to be adapted and applied to other professional contexts in which the training processes integrate the use of simulations as a skill development tool, such as firefighters.

## **Methodology**

The research was conducted at the Portuguese National Fire Service School (Escola Nacional de Bombeiros – ENB) and involved 89 fire officers from different fire brigades of all over the country who attended the refresher training courses for operational management in 2018 and 2019.

The data of this quantitative study were collected during 12 training courses taught at ENB in that period. Each training course included seven to eight students, all experienced

## **Evaluation of the Pedagogical Model Used in Virtual Reality Simulations for Training Portuguese Firefighters**

incident commanders with at least five years of service in the role. There were no statistically significant differences between the groups of participants, in terms of age, qualifications, years of service and professional training.

The refresher training course aimed to develop and assess competencies related to situational awareness, decision making, plan, communication, command & control and review. The course included a theoretical session and practical sessions based on simulation exercises, with formative and summative assessment.

The simulation exercises consisted of eight different virtual reality scenarios, from forest fires, urban and industrial fires, to accidents with multi-casualties and accidents involving hazardous materials. The scenarios created using the XVR software (Figure 1) were based on actual situations and the operational experience of the trainers' team, considering the learning objectives to be achieved and challenging learners to make critical decisions in complex situations. During exercises every student played as incident commander in two different training scenarios and their performance was assessed using Effective Command (Lamb, 2016).



Figure 1. Virtual reality scenario of an urban fire

The Effective Command model referred by Lamb (2016) is an assessment tool designed specifically to assess command competencies in a training context. The methodology is based on the observation of competencies, called decision-making behaviours, which are demonstrated by participants in exercises developed in virtual reality simulation or real fire exercises. Decision-making behaviours focus on the specific competencies that are required for the role of Incident Commander (Lamb, Davies, Bowley, & Williams, 2014). The application of this model is only completed after the debriefing conducted by the facilitator, where the participants reflect on the decisions taken and explain the reasoning behind their decisions, allowing the facilitator to carry out the assessment (Lamb, Davies,

Bowley, & Williams, 2014). The results of students' practical performance will not be considered in this paper.

The students' perceptions regarding the training course were collected through an evaluation questionnaire that was designed based on the studies by Hall (2010), Bayouth (2011), Gillespie (2013), and Keskitalo (2015). Students were asked to fill the questionnaire at the end of each course, which consisted of 5-point Likert-scale questions. For this paper were selected 12 questions of the questionnaire and quantitative data were studied through descriptive statistical analysis.

The researcher informed the participants about the study's background, objectives and requirements for confidentiality and anonymity. Informed consent was obtained to participate in the study.

## Results

The students ( $n = 89$ ) evaluated the implementation of the pedagogical model indicating their agreement with the statements about each of the phases of the model (Table 1).

Table 1: Students' evaluation regarding the implementation of the pedagogical model in virtual reality simulations

Statements	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
<b>Pre-activities</b>					
Pre-course study materials provided to students were adequate.	0%	2%	6%	69%	24%
Course objectives were clearly defined.	0%	0%	0%	47%	53%
<b>Introduction</b>					
Course objectives were communicated to students.	0%	0%	0%	42%	58%
Students' previous knowledge and experience were considered during the course.	0%	0%	6%	67%	26%
<b>Simulator and scenario briefing</b>					
Adaptation to work with virtual reality simulator was simple.	1%	0%	0%	51%	48%
Support given by facilitators throughout the simulations was individualized.	1%	4%	3%	45%	46%
<b>Scenarios</b>					
Exercise scenarios were developed realistically.	0%	0%	3%	61%	36%
Evolution of emergency situations during exercises was realistic.	1%	4%	6%	58%	30%
<b>Debriefing</b>					
Critical reflection on performance was stimulated by facilitators during debriefing.	0%	1%	1%	38%	60%
Feedback provided by facilitators in debriefing enabled the identification of improvements in performance.	0%	0%	0%	36%	64%
<b>Post-activities</b>					
Training was aimed at solving problems related to professional context.	0%	0%	1%	55%	44%
Competencies acquired in training had practical application in professional activities.	0%	0%	0%	45%	55%

According to the results obtained in the statistical analysis, we can perceive that most of the students agreed or strongly agreed with the statements concerning each phase of the pedagogical model.

Most students strongly agreed with the statements about clear definition of course objectives (53%), communication of course objectives to students (58%), critical reflection on performance during debriefing (60%), identification of improvements in performance enabled by facilitators feedback (64%), and practical application in professional activities of competencies acquired in training (55%).

Nevertheless, regarding the support given by facilitators throughout the simulation, 5% of the students disagree that the support was individualized, while 3% of the students do not agree or disagree with the statement. Concerning the evolution of emergency situations during exercises, 5% of the students disagree that the evolution was realistic, while 6% of the students do not agree or disagree with the statement. About pre-course study materials provided for students, 2% of the students disagree that the study materials were adequate, while 6% of the students do not agree or disagree with the statement.

## **Conclusions**

The training of firefighters must follow recognized pedagogical models and practices for the preparation and development of practical exercises, construction of exercise scripts, creation of scenarios, conduct and evaluation of exercises and simulations.

The pedagogical model proposed by Keskitalo (2015) establishes an architecture to design, develop, conduct and evaluate simulations, defining a set of activities to be carried out by facilitators (trainers) and students in each phase, of which it is important to highlight the following guidelines:

- Learning objectives should be established and checked those during the learning process;
- Student's previous experiences should be the starting point for learning activities;
- Student's adaptation to the simulation system is essential before training begins;
- Individual differences in learning should be considered when possible;
- Scenarios should be based on real events and situations should evolve realistically;
- Students should work on simulations as they would in real life;
- Students should practice critical discussion and reflection about their performance;
- Students should receive individual guidance and feedback.

Considering that the implementation of the pedagogical model was evaluated by the students' agreement with the statements related to each phase, we can conclude that the

vast majority consider the model successfully implemented throughout the virtual reality simulations.

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## PEDAGOGICAL MODELS FOR COMPELLING LEARNING EXPERIENCES WITH TECHNOLOGY

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### Abstract

Technology offers tremendous opportunities to improve learning experiences and outcomes. However, we should be striving for technology-enhanced learning that not only brings more to learners, but demands more of them as well. Learning experiences that strive for significant impacts should challenge learners to solve problems, conduct investigations, strategize courses of action, or construct knowledge through personal projects. Such experiences can bring out the aesthetic potential of learning, leading to transformative outcomes. This paper argues for the importance of considering this aesthetic potential to make learning compelling, and describes four instructional projects developed in my own work in recent years. These projects used four different, well-researched pedagogical models as the basis for their approaches.

**Keywords:** Technology-enhance learning, learning strategies, learning experience, aesthetics, instructional design, case-based learning, inquiry-based learning, game-based learning, project-based learning

### Aesthetics and Learning

Educational technologies have slowly, and often rapidly, changed the learning landscape in the last 40 years. Today, learning opportunities include information on demand, digital multimedia demonstrations and explanations, self-directed smart tutorials and simulations, and telecommunications via the internet that connect learners to distant teachers, colleagues, coaches and mentors. Artificial intelligence promises to personalize learning experiences as never before.

But some things do not change with the changing technology. Learning still occurs more deeply and leads to more transformative outcomes when learners are required to give more of themselves to the effort. Ideally, we should be striving for technology-enhanced learning experiences that not only bring more to learners, but demand more of them as well. Learning experiences that strive for significant impacts should challenge learners to



solve problems, conduct investigations, strategize courses of action, or construct knowledge through personal projects.

This perspective might be distilled to the long-held principle of “learning by doing”, but this does not capture the rewarding feelings of transformation possible (and often sheer joy) that make learning a compelling activity. A more complete description are the words, “aesthetic experience”. In general terms, aesthetic learning experiences are compelling, immersive, demanding, and lead to intrinsic rewards of accomplishment. They achieve this by presenting challenges that encourage high levels of engagement and demand resolution, or consummation. This concept of aesthetics relates to Pragmatist (Dewey, 1934/1989) and other aesthetic theories that broaden the concept beyond the fine arts to experiences of everyday life, which helps to solve the puzzle of the existence and universal rewards of the arts in all cultures, as well as the many activities that have been classified as arts throughout history (including, among others, physical skills, ceremonies and warfare) and the explosion of new art forms in the post-modern period into performance art, environmental art, and installations.

I and others have argued in recent years that there are inherent aesthetic qualities to effective learning experiences, not unlike those experienced in appreciating great works of visual, musical, literary, environmental and narrative arts (Parrish, 2005; Parrish, 2009; Parrish, Wilson, & Dunlap, 2011). Moreover, we have argued for the importance of attending to these qualities of learning by teachers and designers of learning experiences. Experiences, by nature, are transactional (Parrish, Wilson, & Dunlap, 2011). In other words, both the situation and the individuals involved have critical roles in the developmental potential of the experience. The situation, in the case of teaching, can be more or less immediate, malleable, compelling, resonant, and coherent. The individuals involved can be more or less intent, present, open, and trusting. Both are critical to the nature of the experience, both equally responsible. Pedagogical models that emphasize these elements in the situation, but also demand them from the individuals involved, are likely to be the most successful.

The performative qualities of learning and teaching, like other performances we engage in for inherent rewards (i.e., not necessarily performance as entertainment), can be best described as aesthetic (Shusterman, 2000). The narrative arc that describes how we engage with works of art, in other words, how art does its work, also describes learning. In both cases, we enter a problematic situation that demands attention and resolution, confront challenges and increasing levels of complexity, and to varying degrees, achieve a resolution, or denouement, that unifies the experience. This is most obvious in narrative works of art, but also in other experiences, like walking through an interesting work of architecture or listening to a driving musical composition. Even more fundamentally, this

arc comprises any act involved in being an effective agent in understanding and influencing our environments--which include the intellectual capabilities we contribute, along with external, physical qualities and other actors within the ecosystems in which we live. The narrative arc is an important and fundamental element of life, and not just art (Dewey, 1934/1989). It drives us to our achievements and encourages us to strive for more.

In previous papers, I have explored the aesthetic dimensions of learning and teaching, and defined aesthetic principles for instructional design (Parrish, 2009). In this paper, I intend to further this work by describing several general instructional strategies, often known as *learning methods*, that I believe encourage aesthetic learning experiences. These will be exemplified in my own work during the last 15 years as a designer of instruction and manager at a not-for-profit science education organization, the COMET Programme, in Boulder, Colorado, USA, and as a manager of training activities in an specialized agency of the United Nations, the World Meteorological Organization.

These strategies include *case-based*, *inquiry-based*, *game-based*, and *project-based* learning. Each of these have been the subject of significant research into learning and instructional design theory. They have mostly been studied in terms of their cognitive foundations, while I am concerned here primarily with their aesthetic affordances. These two viewpoints are not in conflict, but complimentary. In the broadest sense of aesthetics, all human activities, including intellectual ones, have aesthetic potential due to the challenge, engagement and rewards they can bring.

### **Case-based Learning: Polar Lows Ungava Bay 01 December 2000**

Cases have been argued as one of the basic ways we store knowledge for making decisions (Kolodner & Guzdial, 2000; Schank et al., 1999). We recall experienced or learned cases to provide guidance for taking action whenever we encounter problematic situations. Research has shown that professionals that are required to make critical decisions rapidly, like fire fighters, use their repertoire of cases to guide them in new situations.

The case-based, self-directed learning module titled Polar Lows: Ungava Bay, was developed by the COMET Program in 2004 for weather forecasters who face critical decision making during the rapidly evolving phenomenon in high latitudes known as “polar lows,” which move toward lower latitudes over cold waters, bringing severe winds, rains and snow. Ungava Bay, where this case takes place, is in the far north of Canada. (The module can be found at COMET MetEd website (2004). Note that the use of Flash programming can limit usability in some browsers.)

Nearly any case-based learning design can be highly engaging due to the natural narrative in the unfolding of the case. The particular design of Polar Lows places additional demands

on the learner due to its learning object-oriented design that first asks the learner to make diagnostic and then prognostic decisions based on data products provided, such as satellite imagery and atmospheric temperature and moisture soundings, and only then recommends the learning object resources that provide background knowledge for guiding those decisions. The learning objects use text, narration, and animation to describe information such as the formation mechanisms of polar lows and atmospheric conditions that drive the evolution and movement of the system. In other words, the case uses the reverse of the traditional explain-how-and-then-practice approach. The case is composed of a Case Overview that sets the background context, a Case Challenge that requires 8 different decisions, and only finally a Case Summary, which offers a traditional explanatory lecture regarding the case.

During the Case Challenge, a learner is allowed to study the provided weather data products, which incrementally changes through the temporal sequence of the event, to make initial decision attempts before refining the decision based on expert guidance. The learner can study the recommended learning objects and make the initial diagnostic and prognostic decisions whenever she feels ready, and then receive detailed feedback on their likely correctness before deciding if additional study would be helpful before moving on to the next decision. The chosen case is a complex one, with built-in, non-intuitive complexities, introducing a few surprises and requiring creative thinking. The final Case Summary provides a logically flowing descriptive analysis of the case to ensure that the learner takes away the key lessons offered by the case.

This online module won a 2004 Brandon-Hall Excellence in Learning Gold Medal Award in the Custom Content category, which highlights exceptional work in the field of online learning. Learners that used it were likely at first surprised by its unconventional format of just-in-time information rather than a more guided learning approach. Statistics show that Polar Lows has been used in nearly 500 online sessions, which is not an exceptional number of uses for modules developed by the COMET Program. (Online sessions correlate to completions, but does not exactly indicate completion). However, one additional case-based learning module was designed using the same object-oriented, learner-driven approach, "Ocean Effect Snow: New England Snow Storm, 14 January 1999". It has been used in over 850 sessions. The phenomenon that drives the case, due to its higher occurrence among the learner audience, likely led to increased popularity.

### **Inquiry-based Learning: Tsunami Strike! Caribbean Edition**

Inquiry-based learning essentially asks learners to behave like researchers, to learn the way researchers methodically investigate a body of knowledge or evidence to come to conclusions. Instructors that use this strategy might pose questions, problems, or

hypotheses, or tell stories of problematic situations that will naturally engage students' curiosity. They then ask learners to follow a process of inquiry to resolve the indeterminate situation created. Problem-based learning is a popular form of inquiry-based learning (Hmelo-Soéver, 2004; Savery & Duffy, 1996).

In a way, inquiry forms the basis of all useful learning, which begins with a question or an experience that requires an answer or resolution. The skills required for an effective inquiry are needed in every profession. All professionals need to be able to solve the problems that they encounter and seek information to make decisions. Inquiry requires more than remembering facts, concepts, and principles, it also requires higher-level thinking skills such as critical and creative thinking, analysis and judgment, as well as problem solving and decision making. Inquiry also generates motivation by establishing a natural drama based on seeking the answer to a question or resolving a puzzling phenomenon. When brought to the fore of a learning experience, inquiry changes the tone of instruction from passive reception to intentional action.

Tsunami Strike! Caribbean Edition (COMET MetEd, 2017), developed by my team within the COMET Program and published in 2012, using HTML and Flash-based programming, is designed for middle and high-school learners, who are asked to take on the role of a journalist writing an article for a news magazine on the potential occurrence and impacts of tsunamis in their home island countries. Sixteen multimedia lessons (learning objects) on tsunami science, geography, safety, and history are interwoven as resources the students can use as background for producing the article. The material is aimed at students ages 13-17, helps students to learn about tsunami risks in the Caribbean region due to ocean-based seismic and other events, which contributes to curricula in physics, earth sciences, geography, and social science. Reviews and feedback on the articles produced by students requires work by dedicated teachers--this is not a fully self-directed learning experience like Polar Lows.

Tsunami Strike! Caribbean Edition, at one point, became one of the most highly used COMET Program modules, reaching 2750 user sessions. The space to contribute to the experience given to teachers who employ the module in their courses may increase their desire to use it within their curricula. A closed, self-directed module might not have the same impact. In effect, an open educational resource that requires local adaption and inquiry-based learning by students creates an aesthetic opportunity for both teachers and learners.

## **Game-based Learning: Learnopoly**

Game-based learning is not grounded in a single learning theory, but much research has been conducted on the effectiveness of using games and gamification to engage learners to reach higher levels of engagement and develop complex cognitive skills (Gee, 2013; Myers & Reigeluth, 2017).

Games are universally used to provide challenging environments for intellectual stimulation and/or physical exercise (Callois, 2001). They also serve a social function, but perhaps foremost, they create a goal and competitive environment to stimulate and heighten performance. Their use in education has probably always existed, but in response to the immense popularity of computer video games, the potential to motivate students increased interest in game-based learning during the last three decades. In a way, games offer a practice field for life skills, both social and cognitive, and the interest of educators in using games as a serious component for learning has rapidly grown with the support of technology. Games offer a safe but motivating environment for practice.

One of James Paul Gee's sixteen principles of good game based learning is "Performance before Competence" (Gee, 2013), the proposal that people should be able to gain competence through taking action, and not just practice performance after gaining competence. This principle is in concert with the preceding designs described in this paper.

Learnopoly is a game designed for exercising skills of instructional design for active learning approaches, where competing teams of players race to design learning activities for randomly assigned topics in their professional field of meteorology, for online or classroom use. The design constraints are determined by randomly choosing cards and spinning a wheel. Cards decide the type of learning activity that must be designed (discussion, case study, project, simulation or role play, practice exercises, collaborative decision making, Socratic lesson, etc. ), and the spin decides the delivery mode--whether the activity will be carried out synchronously online, asynchronously online, or in a classroom. The goal of the game is to offer a creative challenge to trainers to use different learning activities for different delivery modes in effective and engaging ways. The game offers a safe and entertaining environment where players are forced to challenge themselves to come up solutions they might not otherwise do in the current work environments. The game was designed by Maja Kuna-Parrish and myself for use in two training workshops, one in a face-to-face environment using physical cards and spinners, and one delivered online, using software to randomize the selections and small group discussion forums for team communications.

The goal of the game was for teams to develop as many valid, brief learning design descriptions as possible within the time constraints, competing with the other teams to

develop the most and best judged designs. Decisions on “best” designs were voted on by all teams at the end of the session, after each team nominated one of their activities and described it to the other teams.

Slides depicting the game play, used to introduce the game online (Kuna, 2014). Learnopoly was first introduced as a workshop activity at the 2014 Eumetcal Workshop held in Warsaw, Poland, from 10 to 13 June. Over 30 players tried out the game, successfully came up with a large set of solutions, and provided useful feedback for game improvements. A similar number of participants joined the online version on year later. Feedback in evaluations showed that the participants appreciated the game characteristics (fast pace, randomly assigned content and delivery choices, time constraints, and competition) as well as the small group brainstorming, discussion and decision making. Some respondents were uncomfortable with the game logistics and creative, fast-paced group work, so more coaching would probably have helped.

### **Project-based Learning: WMO Courses for Trainers**

Project-based learning strategies are, in a broad sense, also Inquiry Strategies, efforts to resolve an indeterminate situation by applying new and existing knowledge in constructing solutions. They are also Constructionist strategies (Papert & Harel, 1991), which promote learning through the process of producing tangible, sharable outputs. In project-based learning, students work individually or in small groups to produce products such as a report, plan, poster, presentation, digital media, or model (conceptual or physical). Through projects, students are exposed to new information, develop new mental models and practice skills in the process of completing the project—in other words, in a relevant rather than artificial context.

Project-based learning tasks have many peripheral outcomes as well, such as developing interpersonal skills, commitment and independence. They are inherently motivating due to their aesthetic arc, with beginnings, middles and ends, filled with incremental challenges, like a good story.

The WMO Online Course for Trainers has been offered at least once annually since 2014, with the goal of developing trainer competencies in regional and national training institutions. It teaches knowledge and skills required to make informed instructional planning decisions, through a process that requires instructional design thinking. So far, it has been offered in 4 languages to a global audience, and has seen over 450 participants achieve successful completion. Because the course requirements include the development of a comprehensive Training Development Plan, the project of the course, requiring detailed documentation of each step of the planning process, this number of successful completions is somewhat remarkable.

Training Development Plan (TDP), based on a template provided at the start of the course is the glue that ties the course together, although many other activities are conducted during the course through the Moodle virtual learning environment in which it is based. In addition, the TDP is immediately relevant to participant work responsibilities. While many participants have never planned training using the systematic method taught, all will have had to make similar training decisions.

For the TDP, participants are asked to choose a training project for which they are currently responsible, or one they need to accomplish in the near future. The final product could potentially be valuable for participants' work, leading to a new or improved course design.

The TDP is developed incrementally starting during the first week, based on content and skills learned in each unit. Feedback is also provided incrementally by a number of Coaches, at three to four points during the course, allowing improvements throughout. The sections of the plan correspond directly to the competencies being taught. The TDP scope and length make this a major assignment – often 10 to 20 pages long – which is significant for a professional development course taught outside a university. However, the incremental production and feedback makes it doable and rewarding for nearly all participants.

Feedback on the course is nearly universally positive, and often glowing, with testimonies that the concepts and techniques taught are revelatory. In reality, I would argue that it is not the course content, but the compelling process of producing the TDP that leads to such positive responses.

### **The importance of compelling experiences**

This paper has described four designs for learning experiences that relied upon technology, but were grounded in proven learning strategies that demand the deep engagement of learners. They were discussed as effective not because they offered easy access to well-designed information, but because they required learners to construct knowledge during creative processes of problem solving, decision making, and production of products. These activities are at the highest levels of cognitive engagement, but can also reach the dimensions of aesthetic engagement. I would argue that aesthetic engagement should be a goal of instruction when our goals are transformative learning and high degrees of personal development, if not always. Learning experiences that are compelling lead to learning that stays in the minds and actions of learners and primes them to become lifelong learners. During such experiences, action is the source of learning--a personal, intentional action--and not simply an attempt to give and receive knowledge. This is certainly not a new argument, but one that demands repeating in a stubborn culture that continues to view

learning as a thing transferred from expert to student rather than something freshly constructed by each learner.

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## EMERGENCY ONLINE LEARNING AT THE UNIVERSIDAD DE LA REPÚBLICA, URUGUAY: CHALLENGES FOR THE POST-PANDEMIC DIGITAL UNIVERSITY

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### Abstract

Between 2005 and 2020, hybrid education at the Universidad de la República (Udelar), Uruguay, became universalized through the Virtual Learning Environments Program (ProEVA), with the aim of satisfying the growing demand for higher education, improving the quality of teaching, and reducing the digital and geographic gap. These developments were challenged during the implementation of emergency online learning arising from the COVID19 Pandemic. The article introduces preliminary analysis of this ongoing process, and the challenges they present for the digital transformation of the post-pandemic university, and for the development of an appropriate, sovereign, critical digital pedagogy and caring approach for the Digital University.

**Keywords:** Emergency Online Learning, Digital University, Critical Digital Pedagogy, Pedagogy of Care, Post-Pandemic University

### Introduction

Since March 13, the day the health emergency was declared in Uruguay, 2,097 positive cases of COVID-19 have been confirmed. Of that total, 1,824 have already recovered and 48 have died. Since that date, the Uruguayan population has followed the recommendations of the health authorities, voluntarily adopting social distancing, which has resulted in a successful management of the crisis

Since March 16, all face-to-face educational activities have been suspended, trying to respond to the emergency through the use of existing educational platforms. With a total population of 3,505,985 inhabitants, Uruguay has 148,056 tertiary-level students, of which 107,623 are university students. Of that total, the public sector covers 88% of enrolment with only two universities, one of which, the Universidad de la República (Udelar), comprises 99.4% of students.

A very significant part of the growth of its student population, as well as the territorial expansion and academic offerings, occurred in the last ten years: four pre-university courses, 153 undergraduate courses, 311 postgraduate courses and five initial elective cycles. Its population is around 150,000 active students, 11,500 teachers and 6,300 technical administrative and service staff.

During the first semester all activity was developed through digital platforms. In the second semester, there has been a gradual return to some face-to-face activities, especially for clinical, assistance or laboratory practices. The rest remains in virtual formats.

### **Pre-COVID 19 digital education in Udelar**

Between 2005 and 2020, hybrid education at the Udelar became universal through the Virtual Learning Environments Program (ProEVA), with the aim of satisfying the growing demand for higher education, improving the quality of teaching, and reducing the digital and geographic gap.

In 2008 started the activities of the nascent Project “Generalization of the use of ICT in Udelar” (TICUR Project), accompanied by a Technical Advisory Group (GTA), which in 2011 became the current ProEVA. First, the project, recognizing the restricted use of ICT in teaching practices at that time, promoted the strengthening of institutional capacities, the training of teachers and non-teachers and the creation of a Moodle based digital campus, which we now know as EVA. Most of the resources were invested in the training of teachers, trying to promote the design of learning situations. Hybrid learning combining face-to-face with blended learning or distance education. From one EVA, many EVAs evolved, according to the decentralized structure of the Udelar, being today one of the largest in the world in number of users (334,661 users among students, teachers and others).

Since 2013 an Open Education approach has been developed, and currently, the Digital Open Learning Ecosystem of ProEVA combines EVA with multiple educational platforms and services, developed with free software, that supports communities and individuals in the creation and use and reuse of digital content within the framework of open educational practices.

Until the end of 2019, most of the teaching teams used EVA as an additional and complementary educational resource to face-to-face teaching, although the development of hybrid educational practices, either with an expanded, blended, or distance classroom design, was beginning to become general in almost all the services. The starting point of students and teachers was heterogeneous in terms of their digital education experience,

however, there was an accumulation of successful experiences and a network of Units of Teaching Support (UAEs), ProEVA Articulators and teaching teams with experience in design and teaching with digital technologies.

This scenario was characterized by universal access to EVA, according to preliminary results of the mandatory continuous survey for undergraduate students (Pérez & Podetti, 2020), in which it is observed that 93% of undergraduate students had a user on EVA in 2019. For 56% of the students, EVA is the main source of educational resources for their study at Udelar and for 65% of them it has facilitated a better academic performance. 55% of undergraduate students considered themselves a frequent or very frequent user of the EVA. In those services in which the majority of students perceive that the EVA provides them with the best academic performance, it is in those services that it was being used most frequently. This distribution of the percentage of frequent or very frequent users was present in most of the Faculties between 70% and 79%. Thus, it can be seen that the EVA and online teaching (such as an expanded classroom, blended or distance learning) already had a strong penetration and a high level of use and acceptance in almost all Udelar services.

### **Responding to COVID-19: Emergency Online Learning**

As we already mentioned, the Udelar suspended face-to-face activities on March 16, establishing that teaching activities would be carried out through digital platforms for the rest of the first semester of 2020. It also ensured that all students could follow the courses through the established modalities, distributing scholarships to ensure access to connectivity as well as computers for those who did not have their own. The formats adopted were both synchronous and asynchronous. From the first day of emergency remote teaching, and with the aim of accommodating large groups (more than 500 students) and allowing teachers to continue their synchronous lectures, it was decided to incorporate a number of commercial solutions such as ZOOM and Webex, in addition of ProEVA's Open Digital Ecosystem.

Among the first measures to address the emergency, on March 16th ProEVA delivered its Contingency Plan (Educational Sectoral Commission, 2020), based on an approach focused on caring for the entire university community and its resources, defining the actions as online teaching and learning in emergency conditions. The work proposal, based on a pedagogy of care, seeks to address the diversity and vulnerability to which, as individuals and as an educational community, we are exposed to the emergency situation. Addressing these highly complex problems, this framework integrates the perspective of an ethic of care (Barnes, Brannelly, Ward, & Ward, 2015) as a fundamental dimension of teaching practice (Noddings, 2013; Adams & Rose, 2014) and the consideration of the teaching as

an experience of care. In this way, the Contingency Plan was aimed at generating proposals that consider the moment that society is going through, seeing and recognizing itself as subjects, developing online learning processes with simplicity, commitment and empathy, deepening human contact. On the other hand, the perspective of care extends to technological resources, in whose selection is promoted a rigorous analysis that includes an ethical and digital rights perspective, prioritizing the use of free software and open formats, as well as privacy and data management of user personal data, avoiding those that require students to create accounts. For this, the Udelar already had a digital learning ecosystem, a support and consultation community and a series of open courses for training and / or reuse.

An analysis of the 184 graduate degrees at Udelar (Collazo and Cabrera, 2020) showed that the change to the virtual modality reached 2,720 courses in virtual modality during the first semester of this year, leaving 120 without being lectured because they are practical, workshops or clinics. It is observed that 73% of the curricular units were developed completely in virtual formats, 23% had done so partially, while 4% had not been able to offer them and had been postponed. In June 2020, 24,000 virtual classes were held through web conference platforms.

During the first semester of 2020, the study of the increase in EVA activity (Pérez & Podetti, 2020) showed an increase of 20% in the number of users. This increase is greater in those services in which users declared in 2019, that did not use the EVA frequently. Regarding the percentage variation in the number of courses, it was found that the sum of courses registered in the EVA increased by 28%, with notable differences between Faculties. Those in the Area of Technologies and Sciences of Nature and Habitat showed a growth in the number of courses greater than 50%, while those in the Social and Artistic Area, showed less than 14%, being higher in those Faculties that had registered users with no intensive use.

The most significant and explanatory variation of the changes produced during the past semester is expressed in the increase of two indicators of use that the Moodle statistics show: messages (communication) and questionnaires (evaluation, self-evaluation). According to the report, the number of messages sent through the EVA Forums increased by 149%. The Services that indicate a growth of over 450% are the Faculty of Psychology and the Faculty of Architecture and Design. The rate of messages per user in those Faculties that have the highest growth rate, is what indicates that they processed a change in the use of the EVA, consolidating itself as a means of educational communication. The highest rates of messages per user are presented by the Faculty of Chemistry (11.1), the School of Nutrition and Dietetics (10.9), the Faculty of Nursing (9.4) and the Faculty of

Engineering (8, 8), with the average number of messages per user among the EVAs of 5.1. The evolution of the use of the EVA as a repository to support face-to-face teaching as a Distance Education tool is seen in the rate of increase and in the number of questions registered in the EVA question banks. This is an indicator of the increasing use of EVA as an evaluation and interactivity instrument. The EVA of the Faculty of Medicine (622%), the Central EVA – mainly composed of the regional university centres – (452%), and the Faculty of Architecture (353%) showed the highest growth rate. The services with the least increase also doubled the number of existing questions.

From the study of the evaluation that students make of the educational proposal carried out by Udelar in the month of July (DGPlan, 2020), it is highlighted that of the 99,839 students enrolled in courses during the first semester of 2020, 85% indicated having taken courses under the virtual modality, as a result of the change of modality (DGPlan, 2020), and of these, more than 84.000 students, almost 92%, managed to finish any of these courses under the new modality, which is equivalent to about approximately 77,500 students. The student evaluation of this educational proposal for the semester in virtual mode reflects a favourable level of satisfaction of 56% (they stated they were satisfied or very satisfied with the implementation of the new modality). 20% say they are dissatisfied or very dissatisfied. Emotional involvement and overload of teaching activities were the difficulties with the highest mention in 66% and 50% respectively.

### **Building the Post-COVID19 Digital University**

The potential impacts of this transformation operated by the so-called “great onlineing” (Brown, Costello, & Giolla Mhichíl, 2020), generate concern regarding the way these remote teaching experiences in emergencies lead to uncritical and dubious quality models that affect negatively the current scenario of Higher Education, influencing the digital transformation of the universities that was already being processed.

The University is threatened by the neoliberal model, which treats digital technology as a market server, and students as clients (Johnston, MacNeill, & Smyth, 2018). Added to this, is the deepening of so-called platform capitalism (Srnicel, 2017) accelerating the process of colonization of education by large corporations (Google, Apple, Facebook, Microsoft and Amazon, among others).

Within this framework, university teaching teams need institutional support and teaching professional development strategies to face this enormous challenge, in order to mitigate the potential effects on the quality of education, and to favour that this massive and emergency experience allow to lay the foundations of a digital university model based on appropriate, sovereign and critical developments and social justice. This becomes even

more necessary in the case of public Latin American universities, especially focused on guaranteeing educational continuity in political, social and economic settings characterized by inequity and exclusion, privatization of education and technological infrastructures.

An appropriate, sovereign and critical approach implies addressing digital literacy and the transformation of the curriculum, as key dimensions of the digital university committed to social justice (Johnston et al., 2018). In this approach, the critical digital pedagogical perspective constitutes a central emancipatory element, supporting the redesign of technological spaces and environments for teaching and learning from a radical understanding of digital, pedagogical and social relationships, expanding the possibilities of democratization.

The development of a powerful public education with universal coverage of higher education, conceived as a human right, favours the continuity of access to education in emergencies such as the current one. The development of powerful infrastructures based on public investment favours the conditions for universal access to the internet, and educational technology policies that provide open, free and sovereign solutions that support autonomy in the face of potential market problems in an emergency.

This institutional framework, a framework of teaching potential and open infrastructure, allowed Udelar to give a response according to the circumstances to carry out the emergency non-face-to-face teaching imposed by the pandemic. This response was not homogeneous, because the Udelar is not homogeneous. It was a reflection of the different paths that the different Faculties and university centres were experiencing from that distant 2008 until now. Those services that, from their UAE (teaching support units), promoted the training of teachers and strengthened their EVA were without any doubt, in better conditions than those that did not. Those teachers who understood what their role was in the University of the 21<sup>st</sup> century and were taking advantage of the different free training instances offered centrally by ProEVA or by the UAE of its services, were in better conditions to face this challenge, than one day to the other had to be faced.

The nature of the response does not, and never, depended on the EVA as a tool, but on the didactic design that was carried out for its use. But we can say that in most cases the response fulfilled the expectations of users, that is, university students, the ultimate recipients of these efforts. We especially want to highlight this last aspect. Distance Education taught by universities dedicated especially to this model, is based on a highly thought-out pedagogical design that is the result of an experience of several decades, in which everything is thought out, from teaching practices to evaluation, to be done

remotely. It is not the product of any emergency. That is the big difference and it makes both modalities not comparable.

Already in the 2010 external evaluation report of TICUR, the commission of intentional experts said that it was “an ambitious project in its purposes, since together with objectives of deepening the principle of equal opportunities or decisions on the convenience of the decentralization of the Udelar, it is intended to take on the challenges of the renewal of teaching methodologies through the incorporation of ICT”. Today, ten years after this report, we see how, with the technical-pedagogical leadership of ProEVA, and the network in services, these objectives have largely been achieved. Without the EVA this response to the emergency would not have been possible. With EVA, the Udelar will surely continue to advance in its democratizing objectives, in equal opportunities and deepening from a methodological renewal. A challenge to strengthen it, and generalize its good use.

The “Proposal for the country 2020-2024. Strategic development plan of the Universidad de la República” represents a road map for the redefinition, expansion and hierarchisation of work lines that ProEVA has been developing for 12 years.

On the one hand, it implies the reformulation and updating of the Virtual Learning Environments Program to the challenges of deepening the virtualization processes of university education in hybrid modalities, as well as evaluating its consolidation in complete academic programs in blended or distance modality. This presents important academic, governance, and human and material resources challenges to become a quality proposal.

On the other hand, there is the challenge of matching these processes with the development of institutional capacities that: (a) allow students and teachers to have sufficient digital skills to teach, learn and exercise citizenship in a highly digitized society; (b) expand the teaching appropriation of specific technologies and articulated to the specific didactics of the disciplinary fields, integrated into educational research and the training of highly qualified human resources in the field of educational technology; (c) take advantage of the information available in the various academic management systems and educational platforms, to better understand their impact on student's educational trajectories, and the development of early warning systems for educational disengagement.

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## CAN EMERGENCY REMOTE EDUCATION MAKE UNIVERSITIES “SMARTER”? LECTURERS’ REFLECTIONS ABOUT USEFUL LITERACIES

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### Abstract

The shift of the entire education system onto digital platforms due to the coronavirus emergency has made lecturers and students massively experience digital teaching and learning, its challenges and possibilities. As with another possible lockdown looming on the new academic year Emergency response education (ERE) might have to be turned into the new normal of distance learning, the wisdom learned by the massive online experience of the last semester could contribute to planning a nimble response to educational needs in case universities have to shift online again.

This paper aims at contributing to the discussion on key literacies lecturers might find useful to turn ERE into quality distance education. 24 full professors of English and English linguistics courses from 14 Italian universities have filled in an online questionnaire investigating the challenges and opportunities they have experienced during the emergency which shed light on the multiple literacies they should focus on to plan an effective response to a new emergency, which at the same time could make high school education “smarter” both in-person and online.

**Keywords:** Emergency Remote Education; Higher education; Multiple Literacies

### Introduction

These are not normal times. As the historian Harari pointed out, the coronavirus outbreak has forced governments, businesses, and educational boards to carry out large scale experiments they would never have agreed to conduct in normal times (Harari, 2020). In an attempt to curb the spread of the virus, the Italian government officially declared Italy’s lockdown in late February 2020. Among other things, this forced the entire education system to suddenly shift onto digital platforms that only a few teachers and students were

familiar with; face-to-face courses had to be turned into distance learning in a very short time.

However, an unprecedented challenge can be turned into an opportunity. After a second semester taught entirely remotely and exams performed digitally, the strengths and weaknesses of the academic response to the emergency can be identified. As almost all students and lecturers have experienced online learning and teaching first-hand, they are now able to have informed opinions about the challenges and strategies involved and can provide suggestions to improve the online academic experience. With the spectre of another possible lockdown looming on the new academic year, Emergency Response Education (ERE) might have to be turned into “the new normal” of distance learning. In this context, the wisdom gained by the massive online experience of the last semester can contribute to planning a nimble response to educational needs in case universities have to shift online again.

This paper presents several critical points concerning key literacies lecturers may need in order to transform ERE into quality distance education: the perceptions and reflections of 24 lecturers from 14 Italian universities are presented and discussed in terms of the new challenges universities have to face under these circumstances. Moreover, it sheds light on issues of concern which could make education “smarter” and more inclusive. First, this study will be situated within the existing literature and its novelty will be highlighted; second, the research questions and the methodology used to gather data will be presented; third, data will be examined to identify trends emerging from lecturers’ perceptions and reflections on their ERE experience; finally, specific literacies will be highlighted which may enable us to turn emergency remote education into a smarter, high quality “new normal” in higher education.

## **Literature review and the state of the art**

Until February 2020, e-learning was regarded as a subsidiary tool, a useful helper, a dangerous competitor, a threat to human resources and academic quality, a cheap and profitable marketing booster or a licence for diploma mills. Due to the massive migration of education onto digital platforms, there has been increasing attention to Emergency Response Education (ERE), a branch of distance learning which deals with the unplanned educational response to a crisis. While online or distance education is an option which relies on planning, theoretical and practical knowledge, and consolidated models (Siemens, 2005; Gaebel et al., 2014, Gaebel & Zhang, 2018; Yuwono & Sujono, 2018; Ossiannilsson et al., 2015), ERE is a necessary change in response to an emergency (Bozkurt et al., 2020). Before the Covid19 outbreak, emergency or crisis education had concerned itself with the psychological stabilising of children and young people in warfare

and the aftermath of natural catastrophes mostly in Africa, the Middle East and the Far East (Ruf, 2013; UNESCO, 2020). During the emergency caused by Hurricane Katrina in 2005, for example, American universities mainly focused on the psychological and concrete help of offering housing and facilities (Gill et al., 2006). The current emergency due to Covid 19 is different from the previous ones because, as a pandemic, it has affected nearly every nation on earth, including wealthy western countries on a massive scale (not only in well-defined limited areas) (Harari, 2020; Lau & Ross, 2020). So, dealing with ERE from the lecturers’ perspective this paper aims at contributing to address a loophole in the scientific literature: as it is an unprecedented phenomenon in western countries, scholars have not yet carried out in-depth studies to analyse what happens when a course planned as face-to-face has to become an online experience, and what changes must be made to turn ERE into quality distance teaching.

## **Research questions and methodology**

The main goal of this paper is to investigate how lecturers perceive and assess the academic digital response to challenges posed by the sudden shift from face-to-face to online classes during the academic year 2019/2020 in order to shed light on key aspects universities should focus on to turn emergency remote pedagogy into quality online teaching and learning. It aims to answer the following research questions:

- RQ1: What are the key factors that could turn ERE response into quality digital courses?
- RQ2: What literacies and soft skills do lecturers need in order to support students and guarantee quality distance learning?

These research questions are part of a wider study focusing on the academic response to the coronavirus emergency in Italian universities concerning English Language and English Linguistics courses in Foreign Languages and Economics degree programmes. The main findings are based on the answers of 24 lecturers to an online questionnaire. Universities were chosen randomly and lecturers were contacted via email. Those who participated in the project allowed the researcher to observe 3 live online classes attended by the same group of students and filled in an anonymous online questionnaire which could be completed in approximately 20 minutes. The questionnaire was composed of closed questions, open-ended questions and Likert-scale-based questions. Its three sections aimed at investigating the participants’ digital skills, their teaching experience before and during the outbreak and the difficulties encountered, and best practices suggestions for possible future emergencies. Data was gathered from March to July 2020 and was analysed with a quantitative and qualitative approach: quantitative data referring to lecturers’

answers to closed-ended questions are integrated with their open comments, which help give a deeper insight into their experience and perceptions.

## Main findings

The following section introduces critical aspects of universities’ digital response to the Covid-19 emergency. Two main areas of concern emerged: professional issues, in terms of digital literacy and perceptions of self-efficacy; and emotional issues for both teachers and students, due to the particularly stressful environment caused by the move online.

### ***Professional aspects: Digital teaching literacy and perception of self-efficacy***

By and large, universities offered a quick educational response which allowed students to carry on with their studies during the crisis. Lecturers taught live classes online, recorded online lessons for asynchronous access, pre-recorded video lessons and had online office hours. The survey of lecturers yielded the following results: 50% of the respondents considered their live classes very useful, 41% considered them fairly useful; in terms of the content delivered, 52% were very satisfied and 30% were fairly satisfied. 35% of the lecturers think their live classes were better than face-to-face classes; in fact, they reported more students attended and were more active and asked more questions. However, 44 % of the respondents still prefer in-person courses.

Even though 96% of the lecturers experienced some difficulties with technology, overall the lecturers now feel more familiar with technology after the coronavirus emergency, as shown in the table below. If compared to their perceptions before the emergency, the number of lecturers who felt not familiar at all or just somewhat familiar with educational technologies has decreased, whereas the number of the respondents who felt fairly familiar and extremely familiar has sensibly increased.

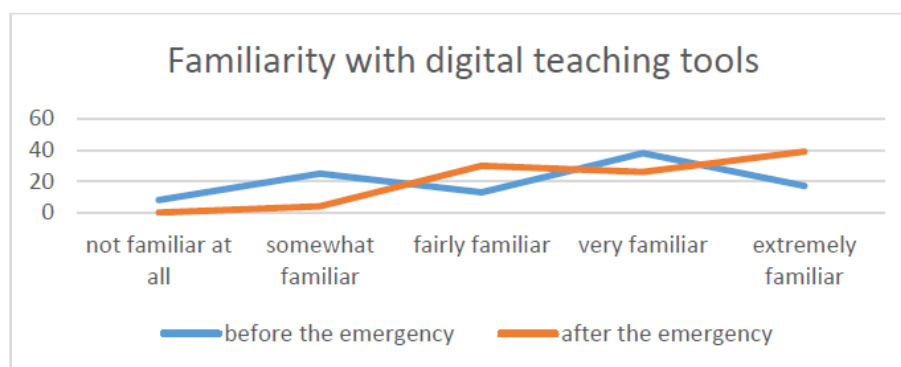


Figure 1. Familiarity with digital tools before and after the emergency

Despite a general feeling of satisfaction, in hindsight some of them would change the way they organized their lessons: they would like to find new ways to introduce content and implement students’ interaction and involvement. Lecturers highlight the need for more

technical support and training to make the most of the digital tools and platforms: some platforms allowed students be more interactive (by providing breakout rooms to work in smaller groups) while others did not, and lecturers would like to have a broader and deeper understanding of different tools in order to be able to answer their students’ needs better. In adapting to the new context, 96% experienced some difficulties, which they faced with different strategies and all-round commitment: 58% explored technology on their own, 21% watched tutorials online, 54% asked their colleagues for advice, 37% contacted the e-learning centre of their university for help, 33% were helped by friends or family members; finally, 17% found it necessary to improve their internet connection and 8% decided to buy a new device which could support the required technology.

Even though 35% of the respondents reported they did not feel sufficiently familiar with digital educational tools, only 9% were dissatisfied with their outcomes. The time commitment was an important concern: most found preparing video lessons very time-consuming (75%), many spent time developing new ways of teaching (44%), reorganising their course schedule and slides (34%) and arranging extra lessons to help students who were struggling (18%). In terms of assessment, only 13% of the respondents declared they did not change anything about their exams; instead, 35% organised mock exams because of the unusual circumstances, 40% had to change or simplify the exam, 17% had to change the type of questions and tasks, and 17% opted for an oral exam to prevent cheating. Despite the technical challenges of the almost overnight shift of education onto digital platforms, lecturers have managed to accomplish their tasks; however, it may have taken a toll on them, as discussed in the next section.

### ***Emotional aspects: digital stress and emotional commitment***

In the unprecedented situation caused by the coronavirus emergency, lecturers have had to face additional responsibilities which have made their emotional commitment more intense than usual. On the one hand, lecturers had to put in place different resources to cope with ERE and feel they should get more support and better working conditions in case of new emergencies: 90% of the respondents highlighted the need to do more to help all lecturers, but particularly those lecturers who are not familiar with technology; more specifically, they identified the need for more training not only to improve their teaching but also to reduce the concomitant anxiety. Citing the difficulties they experienced, 50% of them felt anxious about online live classes and 50% missed human interaction, 48% were worried about wi-fi connection problems, 39% said it was difficult to carry on with the lessons, 35% felt as if they were talking into the void, 22% were afraid of not being able to help students.

On the other hand, respondents reported having to be more aware of their students’ emotional needs as well: lecturers tried to accommodate their students’ wi-fi connection problems (87%), the lack of study material (48%) and elevated anxiety about exams (48%). To support their students’ well-being, lecturers not only organised extra lessons and office hours to listen to their students, clarify doubts and answer questions, but they employed new tools such as digital breakout rooms to increase students’ interaction with their peers.

Table 1: Main issues concerning emotional aspects related to ERE in lecturers’ perception (more than one answer was allowed)

How did you feel during online live classes?	%
I felt anxious about online live classes	50%
I missed human interaction	50%
I was afraid of connection problems	48%
It was difficult to carry on with the lessons	39%
I felt as if I was talking into the void	35%
I was afraid not being able to help students	22%

## Comments and suggestions

As the data described above shows, the sudden shift to ERE has challenged lecturers from both professional and emotional points of view. Even if the respondents were satisfied with their experience of ERE as reported in the previous paragraphs, they emphasized the need for more training and support: to cope with new emergencies and turn their ERE response into quality distance learning, they need to focus on multiple literacies.

### ***Effective digital teaching through multiple literacies***

The respondents experienced new ways of teaching and increased their usual support to students, but they seemed aware of the need for more training to cope with the multiple challenges of remote learning and teaching. ERE has shown that “online learning is not just a matter of using a digital platform to teach the same class that would have been otherwise taught in a physical setting”. They emphasized the fact that the preparation of online classes is time-consuming, as online learning requires a deep restructuring of the teaching approach and the use of different digital tools to satisfy different educational needs (Frattini, 2020). In order to move forward efficiently, therefore, lecturer training in the current context should include the following: *digital literacy*, *workload literacy*, *openness and sharing literacy*, *well-being and care literacy*, and *socio-emotional literacy*, as detailed below.

The respondents pointed out that they could not rely on their students’ usual feedback: lecturers found it more difficult to “read the digital room” and get feedback, which during an in-person class could be provided by their students’ facial expressions, their whispering

or their questions. Even if respondents expressed a very positive opinion of their ERE experience, they missed the repartee which in the past had helped them to make their lessons livelier and to identify students’ needs and respond to them. In response to this lack of in-person interaction, some respondents recorded their online classes to help students who had not attended them; others recorded video lessons students could watch as many times as they liked and answered their questions during their office hours. Others organised digital competitions to help their students to consolidate content and be more involved; still others used breakout rooms to make students interact more. All in all, lecturers proved to be very resourceful, but they feel they would benefit from specific training to improve their *digital literacy* to master the various options smart platforms provide and to offer students different paths and to enrich the activities to meet different students’ needs and learning styles.

Lecturers also found it challenging to plan students’ workload, since in addition to the level of difficulty of the content and number of pages, they also have to take into account what else students might be dealing with, such as stressful events or unexpected difficulties, which is often the case during an emergency (Bali, 2020). So, lecturers could benefit from training on *workload literacy* in order to tailor the tasks according to their students’ needs under those unusual circumstances. More specifically, assessment seems to have been an issue of major concern during the pandemic. As data shows, lecturers needed to change their usual exam format to fit the content and the activities they had managed to include during classes and to prevent cheating; it was more time-consuming than usual and an additional burden to think and plan new exam formats, have oral exams instead of written ones, respond to the emails of anxious students who needed to have more information about the new exams, etc.

During an emergency, libraries may be closed and both students and lecturers may find it difficult to access material related to the courses and exams, as was the case during the covid19 pandemic. As data shows, lecturers were aware of the fact that many students were not able to access materials from their libraries or in some cases, their books. Consequently, they needed to help students, but they had to do so without infringing on copyright laws: as many of their students did not have their books and study material with them during the lockdown, lecturers had to sometimes create and upload more materials onto their university pages, which increased their workload. It appears that *openness and sharing literacy* should be included in lecturers’ training: mastering OER (open education resources) and sharing them with students and with colleagues can help relieve the burden and free up mental space to tackle other issues, such as their own or their students’ emotional needs.



As the data shows, lecturers were put under pressure from various sources during the coronavirus emergency: on the one hand, they had to face increased workloads professionally in addition to their family duties, which also may have increased while their children stayed home from school; on the other hand, they had to meet students’ increased emotional needs and help relieve their anxieties. As carers need to take care of both themselves and their students, even more during an emergency, it appears that *well-being and care literacy* along with *socio-emotional literacy* should be part of specific training. As was shown in the previous paragraph, the respondents reached out to their colleagues, family members, friends, and the e-learning experts from their universities to face technological difficulties; according to their comments, this was helpful. So being aware of one’s own emotional needs and relying on competent help and support can help lecturers to rise to the challenge of the additional tasks due to an emergency, such as being ready to face their students’ anxiety and additional needs. Moreover, the physical distancing established to curb the spread of the virus made classes the only social spaces students could benefit from. Consequently, in addition to showing understanding to their students and providing help and support, they had to organize chats, reply to students’ emails, establish office hours to answer questions and semi-formal spaces for semi-synchronous communication.

To sum up, being aware of the complexities of quality distance teaching and being trained to tackle the major issues appears to be the best way to guarantee a nimble response to new emergencies and to make higher education “smarter” in non-emergency situations as well. Further research is needed to meet lecturers’ needs in terms of training: they have shed light on key elements and questions have arisen, which need to be answered by further and more specific investigation.

## **Conclusions**

Our contemporary society is the most technologically advanced in human history and, in most places, good digital skills and access to technology are taken for granted. However, the coronavirus emergency has shown that the sudden and unplanned shift of education onto digital platforms can be critical from different points of view. To respond effectively and live up to their role, lecturers need to master multiple literacies involving professional and emotional aspects and need specific training and support. As an added benefit the renewed attention to useful literacies for lecturers could lead to a general improvement and implementation of higher education, but further research is needed to provide professionals with the necessary tools and knowledge.

In conclusion, will ERE make education smarter? Apart from helping lecturers and students to accomplish their tasks, ERE has shown key aspects to address. Lecturers’ have

shown positive commitment, and this brightens the outlook for the forthcoming academic year, over which a potential new wave of the virus is looming. Now it is up to faculties to prioritise. ERE might make University smarter in the long run, but faculties should put the necessary resources in place to respond to its call to action.

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## **DIGITAL TRANSFORMATION OF EDUCATIONAL INSTITUTIONS: CHALLENGES, OPPORTUNITIES AND NEEDS CAUSED BY THE COVID-19 PANDEMIC**

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### **Abstract**

Educational institutions have invested in digital transformation, bringing new opportunities, however, also presenting challenges associated with this change. Recently, the Covid-19 outbreak accelerated this process, accentuating online learning in the educational process. The purpose of this article was to present an overview of the challenges and opportunities related to digital transformation of educational institutions and the needs caused by the Covid-19 pandemic. Consequently, to better define the subject, it was conducted a qualitative methodology of bibliographic review. Digital transformation requires a reorganization of educational institutions, not only in the academic curriculum but also in both networking and social ways. Efforts are needed to integrate students and teachers in this digital age since they require training, monitoring and support in both digital knowledge and digital security. Otherwise, there is the risk of disruptions and anguish occurrence in the transitioning process and most of the advances made may not be sustainable. Despite all the known advantages of implementing new technologies in learning, digital divide raises concerns about equity. A good internet connection and availability of equipment are essential to make teaching process uniform and fair. Covid-19 pandemic forced digital transformation and the abrupt change in routines and procedures has putted everyone under great strain, namely teachers. However, this forced change also brought positive aspects such as investment in technologies of the future, with numerous initiatives and learning models already in practice and which are here to stay, as the teaching methods will never be the same after such an impactful experience.

**Keywords:** Digital education, digital transformation, educational institutions, challenges, covid-19.

## **Introduction**

Modern schools face challenges posed by new technologies in terms of the implementation of Information and

Communications Technology (ICT) in the sustainability of management, research and teaching activities (Abad-Segura, González-Zamar, Luque-de la Rosa, & Cevallos, 2020; Tomczyk, 2019). The commercialisation of higher education, for instance, and the need to reform the university as a social institution, have carried themselves into the digital age and manifest new tensions, being other challenges, such as discussions around digital accessibility of course materials and the consequent declining role of the university professor more technologically driven (Nguyen, 2018). Digital transformation is frequently used to indicate a set of mainly technological, cultural, organizational, social, creative, and managerial changes, however, it goes beyond the simple adoption of new technologies, making possible to provide services, supply goods, and live experiences, creating opportunities and impacting society, in a strategic and prioritized way (Gobble, 2018; Maltese, 2018). Recent developments in ICT have transformed the way individuals learn and the Internet, in particular, has made available a virtually unlimited number of sources of information (Pagani, Argentin, Gui, & Stanca, 2016). Massive Open Online Courses (MOOCs) are seen as means through which educational institutions such as universities can become more globally inclusive, with the potential to enhance quality of life in developing countries (Nguyen, 2018). As a result, the learning process increasingly requires the ability to access, locate, extract, evaluate, organize and present digital information (Pagani, Argentin, Gui, & Stanca, 2016). Still, as shown in many research settings, the use of technology in classrooms and schools is still often superficial and not meeting the potential of technology as envisioned by education reformers and researchers in the field (Niederhauser et al., 2018). The fact is that digital transformation is already here, however, it is not yet evenly distributed (Grajek, 2020). Before the outbreak of the COVID-19 pandemic, the world was dealing with the learning crisis, evidenced by high levels of learning poverty being the spread of the new coronavirus, among several disruptions to normal life, necessitated more than 160 countries to effect temporary closure of schools due to safety of their students and staff (Mhlanga & Moloi, 2020; Rashid, Radzniwan, Rashid, Yaman, & Mohamad, 2020). The World Bank estimates that 1.6 billion children and youth were left out of school and about 85% of learners were affected by the fact that educational institutions have suspended their face to face classes (Bran & Grosseck, 2020; Mhlanga & Moloi, 2020). Educational institutions had to quickly launch and adopt online learning platforms in the education sector during the pandemic and physical access, motivation, skills, and actual usage of digital technologies have created a digital divide to those various dimensions of ICT, being the phenomenon even wider in the

context of developing countries (Mhlana & Moloi, 2020; Soomro, Kale, Curtis, Akcaoglu, & Bernstein, 2020). Therefore, to better define the subject, a qualitative methodology of bibliographic review was conducted.

## **Digital transformation and new educational technologies**

### ***Digital transformation challenges for universities and colleges***

Even though it brings new opportunities, digital transformation also poses new challenges for Communication and information technology (IT) departments of universities bringing the need to provide detailed information about a variety of key assets to their users such as information about their students, employees, professors, and researchers, their publications and patents, the courses they teach, and the research projects they conduct (Maltese, 2018). Innovation includes a package of designed curriculum materials, assessment instruments, teacher professional development plan, suite of software tools, school administrative and technology infrastructure, and ways to promote the desired education change (Zhang & Looi, 2011). A study by Xiao (2019), examined how the role of digitalization is framed in the strategic development plans of 75 top universities in China and demonstrated that digitalization as perceived by these universities features instrumentality (e-campus construction and application) and modernization (sustaining and efficiency innovations in teaching and learning), a situation also seen in other countries. Additionally, the authors reported that, on the other hand, there seems to be not enough incentive for them to use digital technologies to serve a wider community and to build technology-enhanced research capacity. There was also stated that scanty evidence of open, flexible, distributed, and disaggregated learning encouraged in these plans.

It is difficult for universities to present a complete, up-to-date, and consistent view of their key assets across the different digital communication channels and digital services employed since the usage of different IT systems since they consist in: institutional communication, library management, HR management, teaching and student support, research and technology transfer support, project management and fundraising, financial support, IT support, legal support, logistics, strategic planning, and many others (Maltese, 2018).

### ***Digital knowledge***

#### ***Library as open access digital publisher***

Since the ascent of the World Wide Web over two decades ago, scholars, academicians, artists, and academic librarians have enjoyed progressively greater, more robust, and more effective access to digital scholarly research resources, permitting a more robust and more effective access to digital collections and tools (Bailey, 2017). The role of digital libraries is

changing, making possible new services supporting the user's activities (Barbuti, Di Giorgio, & Valentini, 2019). Over the last years, open access (OA movement or initiative), that promotes equal and open access to scholarly research resources, has grown and evolved to provide more equitable access for academicians, scholars, and artists beyond those in the developed, fiscally more endowed areas and institutions (Laakso et al., 2011). There are some basic common elements to successful initiatives towards digital knowledge that comprehend that the quality, usefulness and importance is verified for the participants, that the initiative leaders are realistic as to required and available resources (scanning capacity, OCR/optical character recognition tools) and that the shared sense of collaborative team-work is present avoiding and resolving troublesome issues, which are common in such initiatives (Bailey, 2017).

### ***Teachers' perspective about the use of information and communications technology***

A study by Sipilä (2014) investigated teachers' perceptions about how ICT is being incorporated into teaching and learning, the level of teachers' digital competence and what factors, in their opinions, might be delaying the use of ICT in schools. The findings indicated that teachers who have advanced ICT competence use ICT frequently in education and that the majority of teachers do not have the means or knowledge to fully use ICT in promoting learning. Additionally, according to teachers' opinions, students have a good possibility of and knowledge about how to use ICT in studying and learning and state that information literacy and information management should be taught to students, however, the idea of providing personal learning paths in studying and learning processes is less familiar to teachers. The authors state that there are still contradictions between the formal structure of educational institutions (national development processes, curriculum, teacher training) and daily classroom practices (teaching, studying, learning), needing theory and practice to come closer.

### ***Teachers' knowledge about digital safety***

Digital safety is a very important subject when it comes to digital literacy (DL) and it was an interest of study by Tomczyk (2019) that determined the level of digital literacy among teachers, narrowing the DL scope to the issue of the safe use of electronic media. The results showed an unsatisfactory level of knowledge and skills among teachers in some media-related aspects, being the teachers of technical subjects (including ICT) those with the best results, whereas natural science teachers scored the lowest. Age was not a determinant of ICT expertise since a low level of DL and safety skills prevailed in the group of teachers who recently began their career in education breaking the stereotype that young teachers have much more advanced DL than older teachers.

### ***Digital competence and digital literacy and the impact of digital skills on educational outcomes***

An important aspect of digital literacy relates to the impact on academic performance. Pagani et al. (2016) studied the effects of digital literacy on educational outcomes by merging data from the Italian National Assessment in secondary schools with an original dataset on performance tests of Internet skills for tenth-grade students. The results indicated that informational digital skills had a positive and significant effect on academic performance, being also stronger for students in technical or vocational schools. Moreover, the results showed that students with lower reading academic performance are those who benefit more from digital literacy, while for math tests the authors found a u-shape relationship between digital skills and student achievement.

### ***Sustainability of educational technologies***

Another of the several challenges presented by the rise of technological advancements in educational institutions was the sustainability of management, research and teaching activities (Abad-Segura et al., 2020). As presented in (Niederhauser et al., 2018) work, there are multiple interacting factors that influence the change process, and challenges are often encountered when implementing curricular and pedagogical innovations that integrate technologies, which can be daunting. The ultimate goal is to integrate classroom technology use that is more meaningful, purposeful and relevant to students, however, when technology projects have been implemented successfully in educational practice and shown valuable impacts, sustainability within similar contexts is not guaranteed. The results built on the discussions of the EDUsum-mIT 2017 Thematic Working Group 9 (TWG9) showed that teachers in training still maintained positive pedagogical views developed during the collaborative project in teams in their program of preparation of teachers in training, being the most influential factor on teachers' transfer and continuous use of the innovation. Furthermore, it was shown that the second most influential factor affecting teachers' continued use of the ICT-based innovation was their learner characteristics being knowledge and skills related to ICT use the most critical learner characteristics reported. Ultimately, as a worth noting point by the authors was that the most beginning teachers reported having sufficient knowledge and skills, which was an indication of how well the preparatory program contributed to teachers' professional learning.

### **Digital divide and equity in education**

Digital equity is a complex and multifaceted concept and participatory citizenship in the digital era involves the right to access and participate in higher education being a key civil rights issue of the modern world (Willems, Farley, & Campbell, 2019). Access to



information and communications technology empowers teachers and students serving as an invaluable tool in bridging the digital divide, by bringing people together in pursuit of knowledge, encouraging the experiment of new methodologies and paradigms, and, most importantly, by making the process of learning more democratic (Anthony & Padmanabhan, 2010). The increasing reliance on e-learning presupposes ubiquitous connectivity, however, the reality remains that 42% of the world's population does not have access to the internet by a number of reasons, including poor investment in information and communication technology infrastructure in a particular country or different government spending priorities (Willems et al., 2019). Despite increasing educational equity, it is evident that the way digital technology is used today is (perhaps inadvertently) strengthening existing socio-economic inequalities (Macgilchrist, 2019).

A variety of studies investigate digital inequalities in educational institutions such as a work by Soomro et al. (2020) that used a 57-item Faculty's ICT Access (FICTA) scale to assess physical, motivational, skills, and usage levels of teachers of governmental and private sector. The results showed that having access to computers and the Internet in the office or campus lab appears to encourage the use of technologies to support primary professional responsibility. In addition, the digital gap between faculty of public-sector and private-sector universities was found to be more prominent at skills access in respect of the faculty's age and university type. The findings suggested that faculty's physical access to ICT at university, teachers' endogenous motivational access and their general usage access to ICT were the significant predictors of their instructional usage of ICT. Another study by Lembani, Gunter, Breines, and Dalu (2020) explored the nature of access to ICT and how that affects students' ability to access higher education in Africa. The results demonstrated that the spatialities of access to a computer and internet remains a challenge for inclusive open distance learning (ODL) since for students living in urban areas had a significantly different educational experience to students with poor ICT access in urban, peri-urban and rural areas.

## **The Covid-19 pandemic paradigm**

### ***Digital education in disruptive times***

While universities are used to natural disasters like bushfires, earthquakes and tornados, health crises such as the Covid-19 pandemic are less expected and harder to deal with since the last major worldwide health crisis occurred 100 years ago with the 1918-1920 Spanish flu pandemic (Kraus et al., 2020). There is no known cure or treatment for Covid-19 at this moment, which has led to an unprecedented challenge for society due to the chaos and uncertainty it has created (Leung, Sharma, Adithipyangkul, & Hosie, 2020). The impact of COVID-19 and the emergency online migration of university communities is undeniably

huge, nevertheless, the world is only at the earliest of beginnings of recognizing and understanding those impacts on the role of academics and the future of global higher education, remaining many follow-up questions to pose (Watermeyer, Crick, Knight, & Goodall, 2020).

### ***Teachers' perspectives and experiences during the Covid-19 pandemic***

The pandemic unprecedented damage to the educational system worldwide affected in a particular way teachers, who are the most critical intellectual resources of any schools, having to face various types of financial, physical, and mental struggles due to COVID-19 (Vu et al., 2020). In a work developed by (Code, Ralph, & Forde, 2020), the authors explored the experiences of technology education (TE) teachers during the COVID-19 pandemic. Their results demonstrated that the majority of TE students do not have the required machinery and specialized equipment at home, though access to the appropriate tools and technologies forms an essential part of building knowledge, skills and attitudes in the area. Furthermore, TE teachers have found themselves at the cusp of a rapid change that is compelling them to re-think their worldview in both how they teach and how their students learn, necessitating their transformation as educators raising questions about the overall effectiveness of online learning approaches and TE's future and sustainability if offered completely online. Another study by Dong (2020), presented a series of challenges confronting both Chinese teachers and English-medium degree program software engineering Bangladeshi students for their online interactions who were forced to turn to online instruction for academic study. The results revealed that when it comes to students' engagement and participation in online class, all of teachers claimed that just half of students attended the class. Participants also pointed out that students play the most essential role in online courses having both positive and negative experiences towards online classes. Overall, at the initial time of online classes, students embraced a positive attitude towards online class simply because it was an interesting and new teaching style comparing with real class, and they also had much more freedom than before. On the other hand, later on, students faced negative feelings about online class since it brought some difficulties, such as the tedious teaching styles and uninteresting online contents, less interaction with teachers and classmates as well as unfamiliarity with online teaching applications. Rashid et al. (2020) studied the issues around medical teaching during the COVID-19 pandemic and described that internet connection was one of the main issues as lecturers and students still face internet stability problems. Other problems reported occurred due to the limited number of available computers, tablets and mobiles phone per family. It was also reported that many needed to take turns for online learning, which led to the adoption of asynchronous teaching learning method as usually preferred. The authors also mentioned the fact that this pandemic taught medical lecturers to adapt to

changes and optimize the use of technology, not blocking completely the process of teaching and learning, however, more support is need to be given by educational institutions of higher learning such as technical and mental health assistance. A survey made by Watermeyer et al. (2020) to academics working in universities in the United Kingdom (UK), representing all the major disciplines and career hierarchy, showed academics bruised by their experience of emergency online transition and distrustful of a more prolonged and substantial embrace of digital pedagogies by their institutions. Respondents reported an history of professional dysfunction and disturbance, of inequality, exploitation and neglect; of confidence and trust abused and squandered; of disempowerment, displacement and marginalization; of self-concept on trial and in tatters; of vulnerability and helplessness; and of the loss of a much maligned past superseded by the perceived machinations of digital dystopia and threat of professional oblivion. The authors added that COVID-19 crisis appears to have dually quickened the inevitability of technological change or authority of technological determinism and supercharged a sense of existential panic among academics – many of whom appear now snared in the headlights of digital disruption due to significant dysfunctionality and disturbance to their pedagogical roles and their personal lives.

### ***Digital education from 2020 onwards***

#### *A new approach for digital education*

The development of “smart technologies”, digital applications and educational resources of Massive Open Online Courses (MOOCs), Small Private Online Courses (SPOOCs) and several other is a factor of the global educational space transformations, grading the ways of education and its organization, especially in post-pandemic classrooms, in both mainstream and alternate school settings, that will be very different (Cherubini, 2020; Neborsky, Boguslavsky, Ladyzhets, & Naumova, 2020).

There are no universal guidelines for how educational institutions can function during an educational disruption, and even more dilemmas arise when we think about the post-COVID19 period, yet, there are some efforts and solutions that emerge in an attempt to help a smooth and efficient digital transformation such as the RESET program suggested in a study by (Bran & Grosseck, 2020). As the authors suggest, the practices and instruments used by colleagues in West University of Timisoara, Romania, when pressing the RESET button of the educational process, teachers/staff/decision makers might want to take these pillars into consideration: Stability (continue teaching your students), Safety (care for your students, and care for yourself, too) and Stay connected (communicate with your students, and be present whenever it is needed). The authors suggest that the model can be applied internationally, provided that educational institutions ask periodically for

consistent feedback from their respective academic communities in order to make the optimal real-time decisions.

A study by Neborsky et al. (2020), from the vast number of trends that were prominently outlined in the global agenda for the development of universities and higher education, presented an analysis of key trends related to the digital transformation. Firstly, the authors highlighted Outside-the-Box strategies as a mandatory element of the educational policy of universities since digital platforms, including MOOC, provide three possibilities that are seen as values: distance, scale, and personalization, the same these components that made it possible to expand an act far beyond the classrooms, which was an additional opportunity in the context of COVID-19 pandemic. Secondly, Passport to Education, a pilot experiment at Boise State University that starts a new type of relationship between a student and a university, was pointed, being something like subscribing to online platforms like Amediateka or Netflix, costing USD 425 per month for six credit hours or USD 525 for nine in any of two online undergraduate programs being 30% cheaper than full-time education. Thirdly, Network in Education, a growing trend as a new way of organizing social structures in the co-presence and in fourth place Blended Learning, an increasingly popular technology of traditional and online learning combination. In fifth place, the authors pointed Micro-Colleges, the MTI experiment that meets the needs of lifelong learning and opens up new horizons for higher education and Blockchain in Education with the capacity, imperceptibly changing the reality of higher education organization. Ultimately, VR-Technologies, Artificial Intelligence, Chatbots for Learning are also mentioned as new learning opportunities for the future.

## **Conclusions**

The purpose of this article was to present an overview of the challenges and opportunities related to digital transformation of educational institutions and the needs caused by the Covid-19 pandemic. Digital transformation requires a reorganization of educational institutions, not only in terms of academic curriculum but also in both networking and social ways. Efforts are needed to integrate students and teachers in this digital age since, both, require training, monitoring and support in digital knowledge and digital security. Otherwise, there is the risk of disruptions and anguish occurrence in the transitioning process and most of the advances made may not be sustainable. Despite all the known advantages of implementing new technologies in learning, digital divide is a reality that cannot be ignored, raising concerns about equity, both for those who learn and for those who teach. A good internet connection and availability of equipment are essential to reduce the distance between the privileged and the disadvantaged, making the teaching process uniform and fair. Clearly highlighting the pre-existing problem of digital equity,

the Covid-19 pandemic has accelerated digital transformation. The abrupt change in routines and procedures has put everyone under great strain, namely teachers. However, the forced change also brought positive aspects such as investment in technologies of the future, with numerous initiatives and learning models already in practice and which are here to stay, as the teaching methods will never be the same after such an impactful experience. This article will certainly serve to offer a contribution to the existing discussion on a topic that arouses great interest and attention, as it affects our daily lives in several ways.

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## NEGOTIATING QUALITY IN CURRICULUM DEVELOPMENT – A PROCESS OF FINDING A COMPROMISE FOR DIFFERENT STAKEHOLDER AGENDAS

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### Abstract

The research article reports on curriculum quality for an ODL setting in the context of a digital era, from a perspective of a broader educational stakeholder environment. The literature research paper ask the question with regards to divergent, dynamic and sometimes conflicting perspectives and agendas of different stakeholders in the broader education spectrum in an ODL setting. The research paper establishes a thought pattern in searching for the best answer or a compromise with regard to stakeholder agendas by illustrating and engaging in an applicable thought pattern on how evaluation and adjustment operate in an ODL curriculum model. The article asks and addresses specific issues about what is so special about ODL and therefore the value of stakeholder agenda and perspectives in curriculum development. The article assumes that there is a natural sequence in which to work in curriculum development and therefore identifies the research questions that has not been addressed sufficiently in literature with regard to the inter-connectedness and alignment of the components of curriculum development. Going through this analysis, the research will allude to the stakeholder agendas and therefore address the specific areas of compromise in curriculum development. The research adopts a qualitative case study research method.

**Keywords:** DE, Stakeholder, Curriculum, interconnect, agenda

### Introduction

At the outset of this research, the literature on the quality of curriculum development seemed well defined and sufficiently narrow in scope. However, a detailed research on the topic revealed that this was hardly the case. The problem is attributed, in part, to the interdisciplinary nature of the research topic and the uniqueness of ODL pedagogy in a digital era. Numerous research output have been reported in the literatures journals of



education, each looking at the perspective of the stakeholders and their different and often divergent definitions of quality.

The aim of the research paper is to present a scheme that can be used to satisfy the research question, whether are the areas of consensus and mutual agreement or compromise for stakeholders divergent, and different perspectives and agendas in the curriculum development process?. The established scheme is a representation and an illustration of how various components and element of curriculum development interrelate. A clear description of how these elements influence each other is also presented. Therefore the research output can be used as a thought process to establish consensus among different and divergent stakeholder perspectives, interests and agendas, and enable a satisfaction of all stakeholder and their mandate.

The point of departure was the exploration of published research on curriculum development and design. Various concepts that underpin different perspectives on curriculum development are discussed. The role of ODL in developing a curriculum is discussed and a set of key concepts for curriculum development is established from literature. The key concepts are used as a basis for evaluating perceptions and agendas of different stakeholders on curriculum development and design. The resultant of this process is the identification of the key components of curriculum development and the relationship between them.

The research will then bring in the interrelationship idea between the key concept of the curriculum development and design, and map a link between the key curriculum development concepts, thereby, introducing areas of common interest between the key curriculum development concepts. These areas of common interest are the manifestation of common ground, mutual understanding and consensus for stakeholder's different mandates, agendas and perspectives.

## **Methodology**

Qualitative case study methodology affords researchers opportunities to explore and explain a phenomenon within its context using a variety of data sources (Baxter & Jack, 2008). This approach ensures that the phenomenon under study is explored through a variety of lenses which allows an in-depth understanding and allows multi facets of the case under study to be revealed and understood (Baxter & Jack, 2008). The case study approach aligns to the goals of this research in that the focus of the study is to explore and explain “how” (curriculum development for ODL in a digital era) and it covers the contextual conditions in which the phenomenon under study occurs.

The unit of analyses (case) in this study is a focused literature review on curriculum development for ODL in a digital era. The attributes of this research satisfy the definition of a case as stipulated by Miles and Huberman (1994) and they are in line with Yin (2003) and Stake (1995) stipulations concerning setting boundaries for cases in a case study research approach (Baxter & Jack, 2008). The research also appeals to boundaries stipulated by Creswell (2003), those of time and place (Baxter & Jack, 2008). In line with the boundaries of the definition and context, and the research question (i.e. whether are the areas of consensus and mutual agreement or compromise for stakeholders divergent, and different perspectives and agendas in the curriculum development process?), the type of case study this research adopts aligns with explanatory and exploratory or descriptive case study as categorized by Yin (Baxter & Jack, 2008).

This research will lead to a development of solutions or recommendation that will address the following propositions/ issues regarding to divergent, dynamic and sometimes conflicting perspectives and agendas of different stakeholders in the broader education spectrum of an ODL setting. Propositions and/or issues are necessary elements in a case study research in that both lead or precede the development of a conceptual framework that guides the research (Baxter & Jack, 2008).

## **Discussion**

Totte et al., (2012), postulates that the term curriculum can mean different things to different groups, when used within the context of higher education. These authors state that sometimes the curriculum is reduced to the structure and content within one course, this paper adopts the description of course and program that is described by Biggs and Tang (2011). Therefore the focus in this paper is on the aspects of curriculum development that goes beyond course design, as is stipulated in Totte et al. (2012). In this paper, as is in Totte et al. (2012), curriculum and program are in fact synonyms.

The research declares that curriculum development is influenced by different stakeholder agendas and perspectives therefore it is not a static description, as noted in Totte et al. (2012). On the contrary, it is a dynamic conceptualization process that cannot be grasped within a single snapshot (Totte et al., 2012). Therefore, because curriculum development process develops continuously due to environmental demands and contextual changes (Totte et al., 2012), to comprehend and illustrate the area of compromise for different and sometimes conflicting agendas of stakeholders, curriculum development is approached from different points of view.

When thinking of curriculum development we should think more widely and consider not only what should be taught and why, but also how it should be taught and how the teaching

## Negotiating Quality in Curriculum Development – A Process of Finding a Compromise for Different Stakeholder Agendas

and learning process itself will be implemented. The latter part on the preceding statement refers to the application of a management cycle in the curriculum development implementation phase. The management cycle will illustrate the different phases of curriculum development implementation and the role played by specific stakeholders.

The discussion that follows identifies the key phases of curriculum development management cycle and the various levels of stakeholder engagement. There-by, introducing the concept of establishing areas on compromise, alignment and interconnectivity between stakeholder agendas and perspectives, at different levels.

The management cycle has four distinct phases, in which various stakeholder agendas and perspectives are engaged (CHE, 2014). The first phase is the Pre-planning phase in which engagement with the outside world into which the curriculum will be launched manifest (as seen in Figure 1 – economic/ policy level). Only if it is feasible in the light of this level of stakeholder engagement, should curriculum development go ahead.

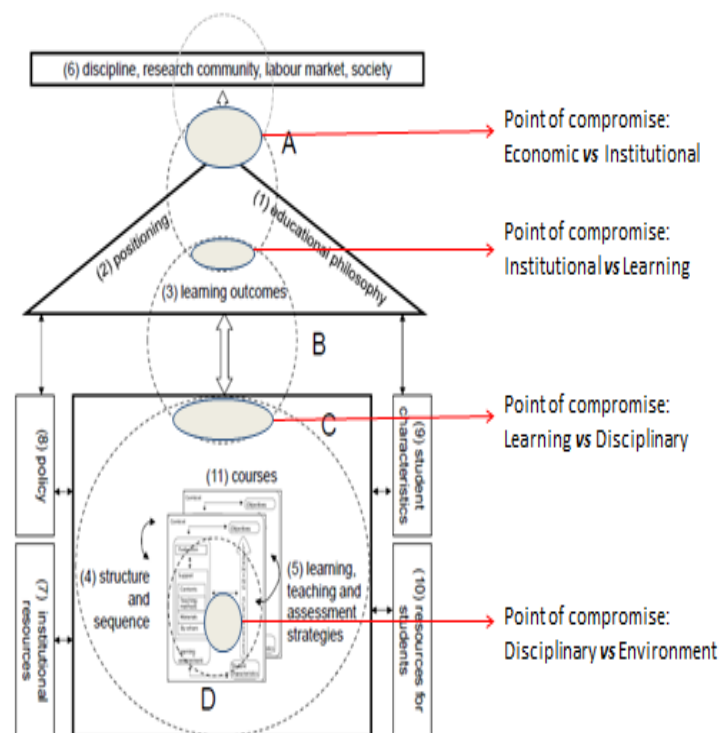


Figure 1. Levels of stakeholder engagement (Source: Moll, 2004)

Figure 2 below gives a summary of stakeholders involved at this level, and these are accreditation bodies, national, state/provincial policy custodians, the research context and the target qualifications. Perceptions of role players at this level influence the curriculum development process and a compromise is needed with the second level of role players, that is, the institutional level role players. Stakeholders interconnectedness and interests in curriculum development may be different but with a common goal of developing an all-

## Negotiating Quality in Curriculum Development – A Process of Finding a Compromise for Different Stakeholder Agendas

inclusive curriculum. Therefore a level of mutual agreement is indispensable and a compromise must be reached. The literature review research seeks to highlight the level of compromise required and issues that pertain to this mutual agreement. This is a point of mutual agreement between the two levels (i.e. economic/ policy level and institutional/ cultural level), where considerations of both are included in what should be the expected graduate or exit level competencies of the programs offered.

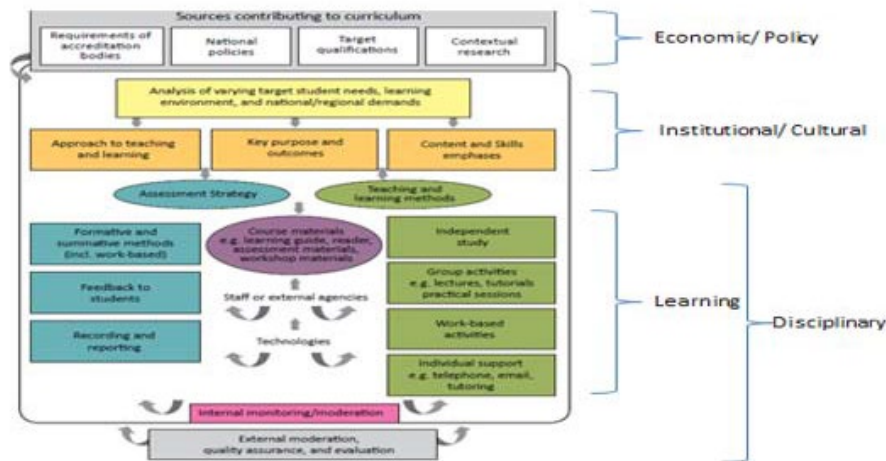


Figure 2: Curriculum design for distance education (Source: CHE, 2014)

Figure 2. Curriculum design for distance education (Source: CHE, 2014)

Second is the planning and development phase in which two steps are taken in the curriculum development process. First is the engagement of stakeholders internal to an academic institution, that is, the institutional/ cultural stakeholder consultation process. This level of engagement is characterized by a good deal of consultation between the academic and service departments such as media, printing, ICT and student support (CHE, 2014).

The main purpose of the consultation is to deliberate on the technical possibilities and the implications of curriculum intentions for an ODL setting in digital era (Lentell, 2007). The outcome of the deliberations will be put together into a development blueprint, which will be circulated through appropriate approval processes internal in the institution (CHE, 2014). Once the approval has been gained, the second step is engaged, in which the design and development of learning resources is the goal. At this point of institutional stakeholder consultation, a compromise is needed between the economic/policy level stakeholders above the institutional level and the learning material design and development stakeholders below, as depicted in Figure 2 above.

The design and development of learning resources activity is the most complex and expensive, level of stakeholder engagement, in the curriculum development management

### Negotiating Quality in Curriculum Development – A Process of Finding a Compromise for Different Stakeholder Agendas

cycle. At this level of engagement various stakeholders may have different agendas and sometimes conflicting perspectives and interests but the goal of all involved is to ascertain that the curriculum is turned into reality (CHE, 2014).

Stakeholder engagement at the level of learning material design and development include perspectives and interest of writers, developers, course teams, discipline experts, editors, instructional and VLE designers, media producers, testing agents, and moderators. These stakeholders need to negotiate a point of compromise with the institutional/cultural level stakeholder interests and the discipline specific stakeholder agendas, as depicted in Figure 2 above.

Last is the production, delivery and evaluation step in the curriculum development management cycle. In this final step, materials need to be produced based on the latest enrolment numbers and audio-visuals and digital materials are produced in their final form. It is only in the delivery and evaluation stage that the course is ready to be presented to students (CHE, 2014), thereby tutorial and student support become the main players at this level of curriculum development process. This is at the discipline specific level of stakeholder engagement and the role players are students, faculty and support services. A point of compromise envisaged is between the Learning material stakeholder perspective and the discipline specific stakeholder agendas and perspective.

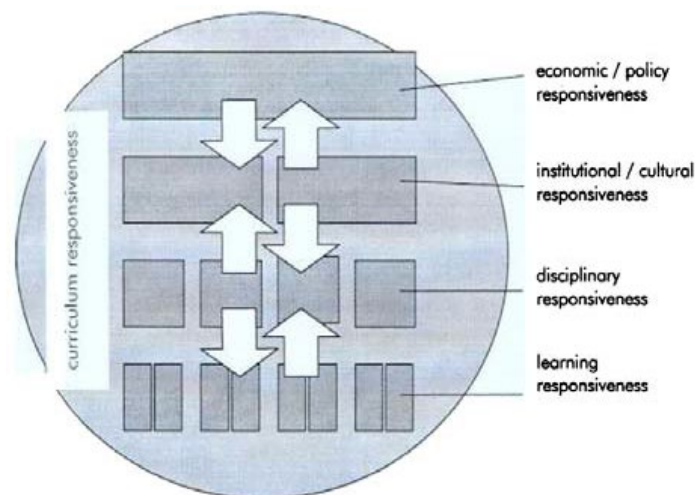


Figure 3. Illustration of stakeholder interconnectedness in curriculum development (adapted Conceptual scheme for curriculum development) (Source: Totte et al., 2012)

Figure 3 is the same illustration of curriculum development as Figure 2, although Figure 3 is from a perspective of stakeholder interconnectedness. Therefore Figure 3 gives a better understanding of the different agendas and perspectives of different stakeholder communities at different levels and stages of curriculum development. So far the literature

review research has made apparent that all stakeholders are influencing (and influenced by) the choices institutions make in defining their planned curriculum (Totte et al., 2012).

To comprehend the complexity of working on curriculum development related issues, four points of compromise are proposed (A, B, C, D), which are closely interconnected. Navigating through all components connected by a circle enables a clear comprehension of the interlace formed by the respective components and their alignment. Comprehending the connectedness created between all components connected by a circle makes it apparent that changing one of the components will influence the other connected components (Totte et al., 2012).

## **Conclusion**

Curriculum development for ODL in a digital era is influenced by different stakeholders with varying and sometimes conflicting perspectives and agendas. Although stakeholder agendas are different, one common goal for all stakeholders is to produce an all-inclusive curriculum that is reflective of stakeholder's interests and aspiration. The outlined hierarchy in stakeholder interaction and the resultants points of compromise does not preclude the existence of an integrated and random interaction between stakeholders.

Stakeholder interconnectedness is not as per levels illustrated in Figure 3 but, the negotiation is guided by the need for mutual agreement on salient points of curriculum development and design. This means there is no prohibition for stakeholders at the economic level to interact with stakeholders at the discipline specific level, for the guiding principle is the need for compromise and a mutual benefit agreement on issues that are a concern for both stakeholder communities, in the curriculum development process.

The hierarchy depicted in Figure 3 is an illustration of generic points of compromise available due to stakeholder interconnectedness. It is also a guide to curriculum development stakeholders to note the three guiding principles in stakeholder consultation for curriculum development and design. The guiding principles are as follows:

- First, there is a need to establish a curriculum design that models good teaching and enables students to develop the necessary competencies (as stipulated by stakeholders), regardless of the mode of provision (CHE, 2014).
- Second, curriculum development must model the desired approaches to knowledge, students and technology usage and reflect a commitment to equivalence of experience to stakeholders concern, irrespective of the distance context (CHE, 2014).

- Third, suitable technologies must be used in ways most appropriate to the learning intention, as stipulated in curriculum development, taking into cognizance the technology profile of stakeholders, such as students and their educators, and the context of practice (CHE, 2014).

Therefore an area for negotiating stakeholder's divergent and sometimes conflicting agendas is critical in the process of searching for the answer or compromise, as highlighted by this focused literature review on curriculum development for ODL in a digital era.

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## USING APPS TO DEVELOP MENTAL CALCULATION IN PRIMARY EDUCATION

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### Abstract

This research aimed to evaluate the development of mental calculation in Primary Education students promoting the use of the Calculus app in a mobile learning environment. It was observed that children have and use several portable devices with internet connection demonstrating that they are familiarized with technology. Therefore, the immanent pedagogical potential in technology should be used by educational actors towards educational success promoting immersive, contextualized, and centred student learning. Action research was elected as our methodology with planned classroom sessions for the development of mental calculation. It was found that the use of technological resources served educational intentions presenting advantages regarding motivation, feedback, time, concentration, pedagogical differentiation, evaluation, and productivity. This initiative, although not without difficulties, demonstrates that the School must assume its role of mediation of the use of technological resources for the development of school skills.

**Keywords:** mental calculation, mobile learning, primary education

### Introduction

The development of technology in general and their devices in particular are recognized by all, but not universally embraced by all dependencies and/or instances of society, namely the School.

In a way, the exceptional time arising from the global pandemic caused by Covid-19 made us [re]think the value attributed to the technologies in the education systems. Despite the clear technological gap between school and society, the responsibility to “mediate the process of transformation of information into knowledge” (Tavares & Barbeiro, 2011; p.7) belongs to the school, since not all citizens exploit this potential. Thus, this role of mediation seems essential in modern times, and like the increasing use of technology in

other sectors of society such as in the business or sports world, the school environment is the right place to foster the use of technology among students.

In this educational environment, and because we wanted to validate scientifically knowledge that is easily recognized as useful to the teaching practice we carried out an investigation in the field of Mobile Learning to identify eventual potentialities for the development of mental calculation skills in Primary Education. So, the starting research question was:

- May the development of mental calculation in Primary Education be improved using mobile devices?

With greater specificity we outlined the following research objectives:

- Determine whether students' motivation is enhanced by tasks performed on mobile devices.
- Check for increased teacher productivity by improving immediate feedback.
- Understand if the use of mobile devices promotes a good classroom climate.
- Determine whether student performance productivity increases.
- Understand if students have developed their mental calculation.

## **Context**

The research took place on a class of 13 students of the 3<sup>rd</sup> grade of Primary Education, aged between 8 and 9 years, in a public school in Azores. Because it is an archipelago of Portugal, cumulatively to the regulating national documents, the educational practice, in this Region, is being guided by the Integrated Plan for the Promotion of Educational Success (ProSucesso – [prosucesso.azores.gov.pt](http://prosucesso.azores.gov.pt)) whose action focuses on three axes:

- Axis 1: Focus on the quality of students' learning;
- Axis 2: Promotion of the professional development of teachers;
- Axis 3: Mobilization of the educational community and social partners.

In summary, our investigative intervention focused on the context of mobile learning (m-learning) using the concept of Bring Your Own Device (BYOD) with specific intervention in the curricular area of Mathematics (mental calculation) seeking to assess advantages obtained from the use of mobile devices.

## **Mobile Learning**

According to Traxler (2015) there has been a growing interest in m-learning observable in the growing number of workshops, conferences and seminars held in several countries: England, Italy, Sweden, Taiwan, and others.

What is Mobile Learning? Not pretending to offer here an exhaustive treatment of the subject we advance that several authors (Cortal & Carvalho, 2011; Laouris & Eteokleous, 2005; Sharples et al., 2005; Traxler, 2015) have presented several definitions about the concept of m-learning depending on the variable they emphasize most. In order to systematize the multiple definitions Cortal and Carvalho (2011) expose the following perspectives on mlearning: (a) from the technological perspective, m-learning is characterized by being a learning supported by mobile devices; (b) from another perspective, it is regarded as an extension of eLearning via mobile devices; (c) in formal education, m-learning is compared to traditional forms of teaching, not limited to the classroom and finally (d) from the perspective of the student and mobility, m-learning happens whenever there is learning by the student who takes advantage of mobile devices independently the space.

In this research we adopted the position of Dias and Victor (2017) on mobile learning considered as all learning carried out through mobile devices at any time and place, being able, therefore, to speak about omnipresent learning in the 21<sup>st</sup> century.

In fact, we consider that m-learning is especially directed to the current generation of students whose attention, according to Carvalho (2019) is more difficult to maintain in the classroom. This generation dominates apps, games, social networks, among other interfaces, through their mobile devices and it is in this context that mlearning can intervene to foster the “involvement, responsibility and creativity of students” (Carvalho, 2019; p.2) highlighting, right away, the possibility of a more student focused learning.

It is undeniable that m-learning entails a set of advantages that foster on a large scale the learning and involvement of the student in the construction of his knowledge.

## **Methodology**

Action Research is a research methodology that was born in the first half of the 20<sup>th</sup> century whose founder was Kurt Lewin. It presupposes a “new way of making” knowledge by the association of theory with practice (Ferreira, 2008). Melo, Filho, and Chaves (2016) assume that Lewin proposed Action Research as a methodology not only for an on-site study, but for participating in the problem.

Thus, the choice for this methodology means that teachers “study students learning by relating them to their own teaching and, in this sense, it is a process that allows them to learn about their practices in order to improve students learning” (Santos, 2017; p.132).

It should be noted that the choice for this research methodology was the subject of deep reflection and originated in 3 fundamental premises:

- *Problem*: Gaps were identified in the school path of the students obtained from the results of the Measurement Tests of the previous school year;
- *Researcher*: One of the researchers is a teacher of the class chosen as a target audience;
- *Pragmatic character*: A pragmatic nature of intervention in teaching practice was postulated in order to improve it.

In order to maintain the anonymity of the target audience or the confidentiality of the information provided in the context of this investigation, we chose to proceed with the codification (Table 1). We adopted a simple coding based on the initials of the participants to transcribe some of the observations, speeches and records of the results themselves throughout the analysis of the results. The cardinals from 1 to 13 were added to facilitate understanding for readers.

Table1: Stakeholder Coding

Typology	Encoding	Date investigation	Applied instruments
Students	S	October 2019	Observation Logbook

## Results

The first classroom session was developed using calculus game and followed a very basic configuration involving three distinct moments (groups, pairs and individual); three operations (addition, subtraction and multiplication) and numbers up to 10. In this format, the game applies a limit time of 1 minute, so in general, these moments were short-lived. At the end of each moment, the number of correct answers reached by the students was recorded (Figure 1).

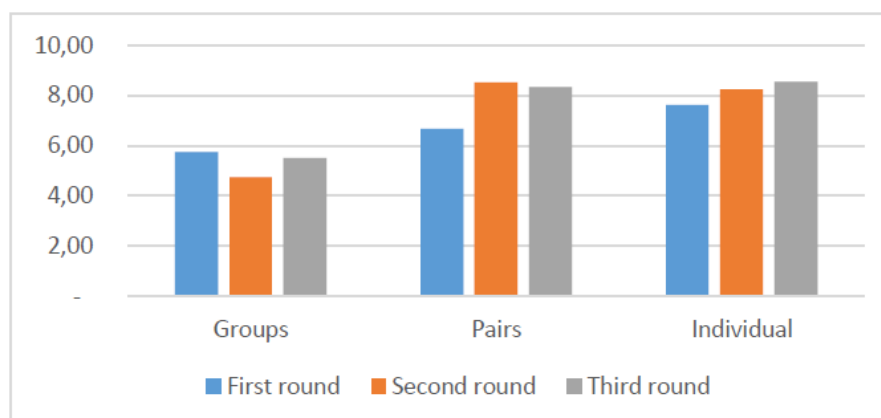


Figure 1. Average number of correct answers in calculus game

Regarding the number of correct answers, it is verified that the phase involving the groups (3 to 4 children) received fewer responses. We deciphered this indicator as part of the

familiarization with the environment necessary for the Calculus game that was unknown by the students, the multiplicity of the operations involved, the time limit imposed by the game, the dexterity necessary for mental calculation and the various meanings involved in the operations. In this matter, it is important to note that Calculus focuses on several operations in its various senses (Figure2).

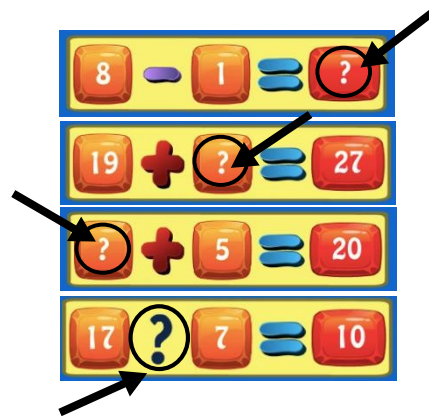


Figure 2. *Calculus*: multiple senses of operations

The moments in pairs and individual stand out for the positive compared to the group reaching greater record of correct answers and it is still to be noted that the data collected are very similar to each other.

After this session, we have seen some advantages resulting from the use of mobile devices in mathematics:

- *Motivation* – the use of mobile devices by students, in the context of the classroom, alone, proved to be a motivating element for the tasks to be performed.
- *Feedback* – students received instant feedback to the answers given which promoted learning and consolidation of the learned contents and competences. It also added encouraging messages such as: “you are on the right track”; “it goes on like this”; “very well”; “splendid”; “show”... which enhanced motivation.
- *Time* – the number of questions answered in the game is higher than those answered in traditional supports, as they do not involve the transcription of exercises for the notebook, nor moments of waiting for correction.
- *Concentration* – students were focused on the questions trying to give the right answers to receive higher scores.
- *Scoring system* – the rankings fostered competition among students. This situation led to a faster response, which in turn is essential in mental calculation.
- *Pedagogical differentiation* – Pedagogical differentiation is also at a distance click because the choice of the degree of difficulty as well as which operations to select are mirrored in the initial menu of the application.

- *Evaluation* – from the observation of the results after each series of questions, the teacher retains a record of the student's level and the progression that is being made.

At the end of this initially planned session and not fully satisfied with the results obtained, we chose to develop two extra sessions. This time, the conditions of the proposed task required configuring the game to include additions and subtractions and numbers up to 20. Under these conditions, the game itself adjusted the time to 2 minutes. Since the students participated in 15 rounds, this comes that for 30 minutes they were focused on practicing exercises that are promoters of mental calculation.

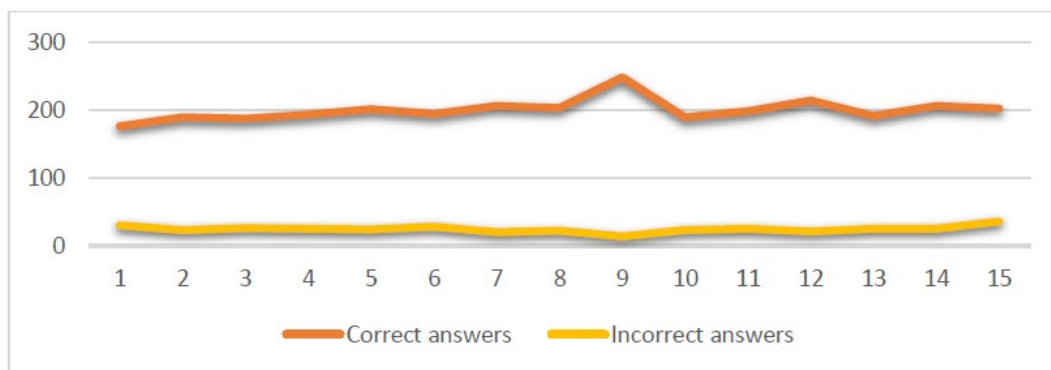


Figure 3. Variation of responses

Regarding the concentration in the activity, it is verified that the amplitude between the correct and incorrect answers is high, which indicates that the students remained focused during the activity (Figure 3).

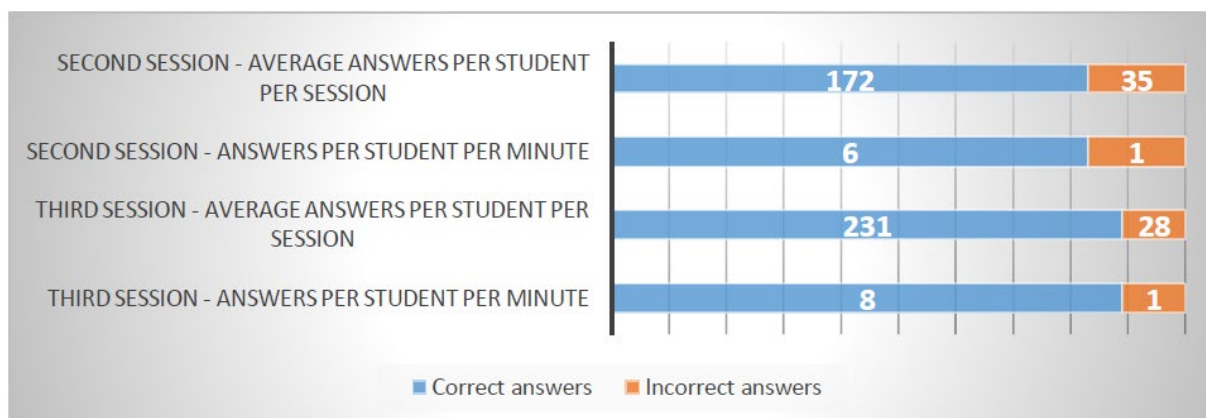


Figure 4. Comparison of correct answers per session and per minute

From the number of answers, we were left with excellent indicators of the work volume produced by the students and of the degree of satisfaction of their own in these about 30 minutes. Based on the comparison of the number of answers as a function of time (Figure 4), we also noticed that from the second to the third session there was an increase of about 34% in the number of correct answers either per session or per minute and a reduction of incorrect answers in the order of 19%. This data can still be confirmed in the

relationship between correct and incorrect answers per minute in which there is an improvement in the ratio of 6 to 1 of the second session, to the ratio of 8 to 1 of the third session.

Also during these specific sessions and by observing the activity in the classroom, it was found that the mobile device used by the student conditioned the number of responses, because the devices with touch screen did not lack the handling of the mouse as in the laptops, which, in turn, conditioned the time available for the answers due to the delay in their handling. For this reason, it was suggested to two students, one who used a *smartphone* and the other who used a laptop, to change devices and to recomplete the task (Figure 5).

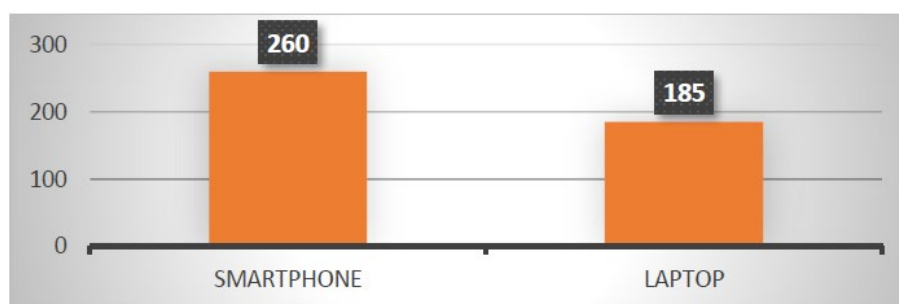


Figure 5. Average responses given in 2 minutes

Regarding the type of mobile device, it can be verified that the answers given on the phone are higher by about 30% compared to those of the laptop, which validates the observations made in the classroom. It should also be noted that this situation does not interfere with the correction of the answers given, maintaining the same pattern of correction.

Thus, it can be concluded that in the case of *the Calculus*, which implies the variable time, mobile devices with touch screen are more advantageous in the volume of tasks performed without this implying differences in the correction of them.

These results show the direct influence of the use of mobile devices with applications appropriate to the skills that are sought to develop and, in this case, the *Calculus* app that promotes the development of mental calculation.

Thus, we consider that the use of mobile devices in properly planned classroom sessions enhances the development of specific competencies in the field of mathematics, promoting increased productivity and motivation; facilitating feedback; and fostering concentration, number of tasks, pedagogical differentiation and evaluation of students.

## Conclusions

Recalling the starting question, “May the development of mental calculation in Primary Education be improved using mobile devices?”, our answer is a categorical “Yes”. However, it is not enough to ask students to use mobile devices or just distribute them without any criteria and expect beneficial results. It is necessary to properly plan the activities involving mobile devices with well-designed objectives for the skills to be developed.

We initially proposed a set of objectives for this research that we now evaluate:

- Determine whether students’ motivation is enhanced by tasks performed on mobile devices.
  - This goal was easily attainable. We would even say that it is enough to present the task to be performed using mobile devices, that motivation arises instantly. The motivation index was measurable, throughout the investigation, by the verbalizations of the students requesting the use of mobile devices.
- Check for increased teacher productivity by improving immediate feedback.
  - We consider that there was an increase in teacher productivity by punctual feedback and final balance provided by the app.
- Understand if the use of mobile devices promotes a good classroom climate.
  - After the initial period of setting the mobile devices, we found that the tasks fostered a greater concentration of students, thus contributing to a good classroom climate.
- Determine whether student performance productivity increases.
  - This was one of the variables that was most noticed by performing mental calculation tasks on mobile devices.
- Understand if students have developed their mental calculation.
  - The ratios obtained in the sessions show that the mental calculation of the students was developed.

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## ADVANCED DIGITAL LEARNING ENVIRONMENTS ON EDUCATIONAL INSTITUTIONS – AN EXPERIMENT

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### Abstract

It is unquestionable to say that we live in a hyper-connected world, where technology is present in all spheres of our life. Furthermore, it is the backbone for the transformation of our society, which is continually changing and requires continuous adaptation of the human being to the environment. (Durães, Carneiro, Bajo, & Novais, 2016). In this paper, we present experience during the Pandemic situation with students at high school. The idea is to improve learning and motivated students to participate in the demands of the task by the teachers.

**Keywords:** Digital Learning Environment, Digital Skills, Methodologies approach, Online Learning.

### Introduction

The coronavirus pandemic has changed education forever because schools, universities, teachers, and students had to adapt to distance learning. There are considerable differences between online learning and face-to-face learning. The first requires that students in online learning be more responsible and disciplined since they have more freedom to search for content. The second requires a great familiarity of users with the use of computers. Finally, the third distinguishes the traditional interaction between teacher, student, and content becomes more complicated with the introduction of technology. In this way, teachers, students, content, and technology had to improve in recent times, to better adapt to the new reality lived.

In a traditional learning environment, the student and the teacher are the key elements in the classroom. Together, the teacher and student take a set of physical, social, emotional, mental characteristics of the classroom. Technologies influence the way the teacher relates to the student and, consequently, affect the way the learning process will progress (Durães, Cardoso, Bajo, & Novais, 2017). Teacher-student relationships are a crucial aspect of learning success and are one of the main aspects that help determine the success or failure of the teacher's work. Relationships considered positive, concerning respect and empathy,

emphasize all students' skills and motivate them throughout the learning process (Hamre & Pianta, 2006). Hence, in this new phase, this topic has become a focal point.

For these reasons, the school should have tools that can engage students and capture their attention. Advances in computers and wireless technologies have also influenced the educational environment, generating a new approach to Ambient Intelligent Systems. The rapid development of technologies, combined with access to content in a wide variety of environments, allows students to experience new learning situations beyond the walls of the school (Durães, Carneiro, Bajo, & Novais, 2016).

Another aspect to consider is the level of attention of the students since it directly affects student outcomes. Attention is a cognitive process, which is strongly linked to learning (Pimenta et al., 2015). When it comes to acquiring new knowledge, attention can be considered one of the most critical mechanisms (Mancas, Ferrera, Ritche, & Taylor, 2016), where the student's level of attention affects learning outcomes, and lack of attention can define a student's success. However, for various reasons, students may not be predisposed to learning. Besides, each student has a particular way of acquiring knowledge, that is, their learning style. In this sense, in online environments, the teacher must have instruments that point out potential distractions that may indicate a lack of predisposition to learning (Durães, Cardoso, Bajo, & Novais, 2017).

Nowadays, students deal with constant notifications in the e-mail, social media, messaging apps, advertisements and so on (see Figure 1). They live immersed in beeps, vibrations, notifications, and icons that blink and that continuously attract the attention of students distracting them (Gottlieb, 2012). Even if they immediately return to the lesson task, the fact that they had to consciously assess the stimuli to decide whether or not they were significant at the time made brain resources waste (Davenport & Beck, 2013; Simola, Hyönä, & Kuisma, 2015). So, it's important that students still motivated and engaged for leaning.

In this paper, we present experience during the Pandemic situation with students at high school of Caldas das Taipas, Guimarães. The idea is to improve learning and motivated students. This paper is organized as follow: Section 2 presents the State of the Art.; Section 3 presents the Methodology applied in the experiment; Section 4 presents Results and Discussion; and finally, Section 5 presents the Conclusions.



Figure 1. Students deal with constant notifications

## State of Art

Based on Figure 2, which present a visual representation of the completed student dimension framework that shows that the four dimensional interact with each other. We can say that exist four dimensions: Knowledge, skills, character, and meta-learning (Holmes, Bialik, & Fadel, 2019).

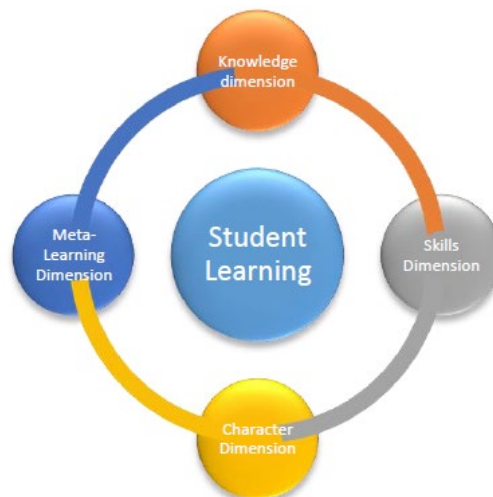


Figure 2. Student learning dimension

The Knowledge dimensional describe what the student knows and understand. The skills dimension rationalizes what the student can do with what he knows. Character dimensions justify how the student behave and engage in the world. Finally, Meta learning dimension explain how the student reflect and adapt to new situations (Holmes, Bialik, &

Fadel, 2019). Based on this student dimension we can design interactions between knowledge areas and skills, character qualities, and meta-learning strategies (Fadel, Trieling, & Bialik, 2016). Examples are expounded in Table 1.

Table 1: Example of construction of interaction between dimensions.

Modern Knowledge	Skills		Character		Meta-learning	
	Creativity	Critical Thinking	Mindfulness	Curiosity	Growth	Metacognition
Entrepreneurship						
Wellness						

## **Attention**

Attention means focusing on clear thinking, among one of several subjects or objects that may capture mind simultaneously. Attention implies the concentration of mental powers upon an object by closing or careful observing or listening, which is the ability or power to mentally concentrate (Mancas, 2007; 2015). In that sense, the concept of attention may be also defined as the transforming of a huge acquired unstructured data set into a smaller structured one where the main information is preserved (Mancas, Ferrera, Ritche, & Taylor, 2016). According to the authors Mancas, Ferrera, Ritche, and Taylor (2016) attention is the first action of perception that analyses the outer real world and turns it into an inner conscious representation and it is also the gate to conscious awareness.

## **Methodologies Approach**

There are several methodologies that teacher can apply in online or face-to-face learning, namely Project Based Learning, Problem Based Learning, Challenge Based Learning, Gamification, Gamification Based Learning, Team Based Learning, and Flipped.

Project and Problem Based Learning are teaching methodologies that promote the learning process based on real or realistic questions/problems that require the active participation of students in the construction of solutions/products (Mills & Treagust, 2003).

Challenge Based Learning it is a teaching methodology that promotes the learning process based on challenges. It starts with a great idea and develops with an essential question, a challenge, guiding questions, activities, resources, determining and articulating the solution, taking measures to implement the solution with the public, and evaluating the results (Johnson, Smith, Smythe, & Varon, 2009).

Gamification uses elements characteristic of games in non-game situations, and Gamification Based Learning uses games in learning (Al-Azawi, Al-Faliti, & Al-Blushi, 2016).

Team Based Learning it is a strategy for promoting collaborative learning with strategically formed teams. It implies the students' prior preparation, based on available materials, individual and team evaluations through discussion with peers, followed by a discussion with the teacher (Michaelson, Knight, & Fink, 2004).

Flipped it is a teaching and learning methodology that reverses the traditional logic of approaching themes in the classroom / formal context. Students previously explore the content made available by the teacher before class and during the class discuss these contents/themes (Tucker, 2012).

## **Methodology**

From the framework of the developed environment described in Figure 3 it is possible conclude that we had created a set of web-resources, then we have worked with the students applying some methodologies, and finally we had used several technologies. The approach followed in this article is based on weekly online activities during the confinement period. It was applying between 17<sup>th</sup> March 2020 and 15<sup>th</sup> July 2020.

At the beginning of each week, the document was made available with the objectives that the students would have to reach that same week. In the same way, the requirements that the students had to present and the respective deadlines were presented.

During the week, students asked questions using available technologies. When the students did not ask questions, the teachers sent a contact email to check if the work was being carried out. Before the end of the week, students had to submit their work on the platform.

At the end of each week, an online session was held, where each student made their presentations. Subsequently, the other students could also make suggestions that could later be re-submitted.



Figure 3. Framework applied

The methodologies used in asynchronous session was Challenge Based Learning methodology. In synchronous sessions was applied Flipped Classroom methodology.

The tools used were: (a) platform, google classroom; (b) technologies, email, google chat, adobe master suite collection; and (c) online session platform, zoom us.

In the case of this work, one of the fundamental requirements is that the students' routines, during the performance of this monitoring, are not disturbed by the data collection process, as any disturbance can have negative consequences on the result.

### **Population**

The study was carried out at Caldas das Taipas High School, where each student has a computer connected at the Internet. All student used the google classroom platform to receive the tasks for each week and submitted their work. All on-line synchrony session was two hours.

The students attended the 12<sup>th</sup> year and were students of the professional multimedia course. In total the class had 23 students, of which 13 were female and 10 males. There were 2 teachers, one male and one female. When the student had a question or asked for an opinion, he did it for both teachers simultaneously. The two teachers were obliged to answer, even if they gave the same opinion.

### **Results and Discussion**

The total of on-line sessions was 17. Figure 4(a) it is presented the number of students that assisted to synchronism session in each session. The average of participation in each session was 20 students.

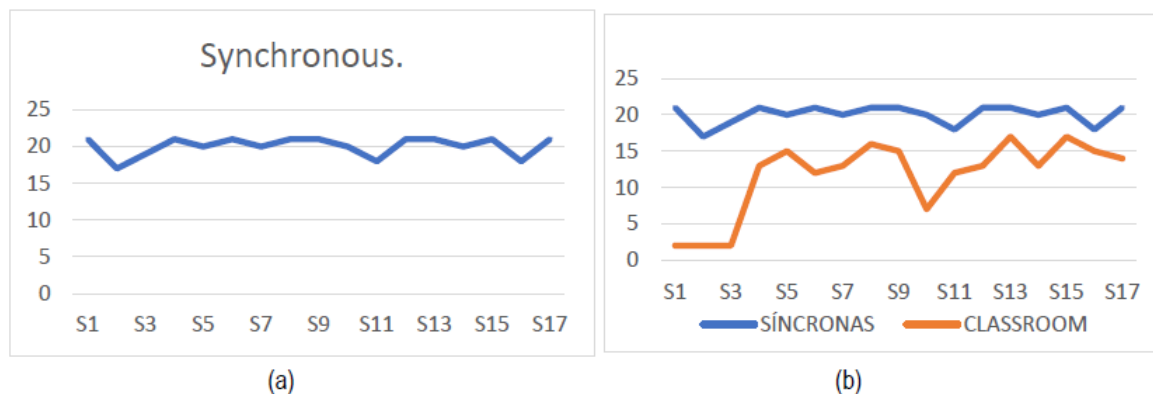


Figure 4. (a) Number of Students per session in synchronous session. (b) Comparison of synchronous session and classroom submission per student.

In Figure 4(b) we presented a comparison between the participations synchronous session and the classroom submission platform.

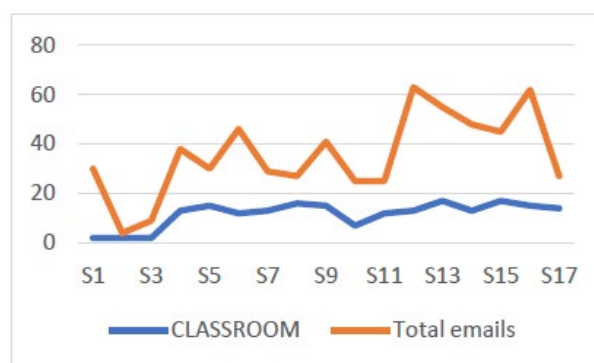


Figure 5. Comparison between activity of Classroom and the number of emails with teachers.

Figure 5 presented a comparison between classroom platform and emails. In each session several emails were exchanged with the teachers. Besides, the same student exchanged a high number of emails per session. The average of emails exchanged with teachers by session was 35.53, and each student exchange email per session in average 8.35.

All students were assessed by a mixed jury of 4 persons. The jury was composed by the two teachers, an invited teacher from other school in the same area, and a person from a multimedia company. All students obtained good results and all students transited the discipline.

## Conclusions

In this paper, we presented the methodology applied to one classroom in pandemic confinement. It was applied between 17<sup>th</sup> March 2020 and 15<sup>th</sup> July 2020. Because it was a subject of work-related training it was created a set of web-resources for each week. Then we have worked with the students applying Challenge Based Learning methodology for the asynchronous session, and Flipped Classrooms for the synchronous session.



The technologies used were Google Classroom, email, Google Chat, Adobe Master Suite collection; and Zoom Us.

Finally, the students were obtained good results and all students transited the discipline.

In future work we intended to implemented more technologies, namely assessment by peer review.

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## **AN EFFECTIVE CLASSIFICATION AND CODING SYSTEM FOR MANAGING AND MONITORING THE UNIVERSITY ACADEMIC PROGRAMMES AND COURSES**

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### **Abstract**

An effective classification and coding system has been designed, developed, and implemented in one of the world's mega universities, named IGNOU (Indira Gandhi National Open University). This system classifies and categorises the various courses of each programme depending upon the nature and description of the courses involved. A suitable and acceptable numbering convention system has been structured for the academic programmes and courses involved. The codes assigned are found to be quite versatile and helps to quickly identify the course level, discipline, and revision version, etc. Also colour codes have been provided in the coding system presented since colours are found to be the unique and commercial medium that appeals to all visually and sensitizes mind quickly and differently. The classification and coding system presented takes care of any ambiguity that may arise while providing data and information, and communicating with internal and external agencies/stakeholders that include learners, teaching, and administrative university staff. The system presented would also be quite helpful for (a) Study material printing division of the university in sorting effectively and quickly supplying the study material to the learners, and, (b) Examination division of the university in quickly and efficiently scheduling the examination datasheets without and overlapping. The classification coding system acts as an effective quality management information tool to make an informed decision to resolve the various day-today challenges in managing and monitoring the university academic programmes and courses. Further, the presented system would facilitate to improve the overall working efficiency of the university education system and help to provide quality education system to its learners.

**Keywords:** Open and distance education; Coding and Classification system; Quality Assurance; University Governance.

## **Introduction**

The major educational institutions especially big universities have to operate a large number of academic programmes and courses for catering to the educational needs of their millions of learners (AISHE, 2019). These programmes are required to be managed and monitored systematically such that the university educational system can perform its academic and administrative functions quite satisfactorily and effectively. In addition, an appropriate coding system is highly needed not only for streamlining but also for operating systematically the various academic and administrative activities associated with the university educational system involved.

A classification and coding system is the terminology system that is designed and maintained with syntax so as that it facilitates to quickly identify the university academic programmes and courses. In this system, the meaning of the codes remains the same whereas the user is facilitated to identify the item concerned and understand the way it works irrespective of language or location. In the information management processing, “the code is a system of rules to convert information – such as a letter, word, sound, image, or gesture – into another form of representation, sometimes shortened or secret, for communication through a communication channel or storage in a storage medium.”(Code, n.d.).

The mega university IGNOU caters to a diverse range of learners that belong to distinct social, economic, and regional groups. It is pertinent that there should be proper synchronization among the learners, teachers, and various divisions for improving the overall working efficiency involved in the herculean task of managing the complete education system associated with the university. To achieve this objective a suitable coding system is presented.

So far as the need requirements for establishing a suitable coding system in the university is concerned, it may be mentioned that in IGNOU, there are many divisions involved in various activities related to university academic programmes and courses. In this university, there are 21 Schools of Study engaged in their regular activities of planning, designing, and developing academic programmes, revision of courses, and undertaking research activities. The academic programmes are delivered through the vast network of 67 Regional Centres (RCs), 3,000 Learner Support Centres (LSCs), 50,000 part-time academic counsellors, and 12 Overseas Study Centres (OSCs) in 10 countries. The term-end examinations (TEE), conducted twice a year, in June and December at about 850 Centres spread all over the country and overseas (Profile, 2020).

The Material Production and Distribution Division (MPDD) which is responsible for the printing of course material, keep the inventory and dispatch the printed material to the students not only before the commencement of the examinations, but also before the assignments are sent to them. This division has to undertake the herculean task that involves bulk dispatch of study material to students in India, and sale of study material to educational institutions and the general public involved.

The Student Registration and Evaluation Division of the university has the prominent task to perform that include registration of students, to make their eligibility list for appearing in the term-end examination, and to look after the work of student support services for different programmes offered by the University.

The programmes/courses offered by IGNOU to a very large student's population that covers online, conventional, multi-disciplinary, and inter-disciplinary schemes, and ranges from Certificate level to Diploma, to Graduate and Postgraduate levels (Annual Report, 2019). Therefore, a proper codification of these courses and the adoption of a standardized method of codification is a necessity for its governance and management.

For streamlining and systematic operation of the above-mentioned activities, it is highly needed to develop an effective classification and coding system for the academic programmes.

In view of the above, an effective classification and coding system for managing and monitoring the university academic programmes and courses was developed and implemented to work effectively with various challenges that emerge due to its enormous size and operational dimensions. This system provides guidelines that facilitate and assist the management and helps to accomplish a system of synchronization between the learners, the teachers and various divisions involved in this herculean task of managing the overall education system. It acts like an effective quality management tool to access the information. The codes are developed as per the statutory structure of the University. A sizeable number of programmes and courses exist and are approved periodically by the statutory authorities of the University. The University recognizes certificate, diploma, and degree level programmes as per the requirements towards horizontal and vertical mobility of its learners.

### **Coding system at IGNOU**

In India, the university shall offer only those programmes which are approved by the statutory bodies of the university as per norms. These norms are in sync with the norms of national regulator i.e. University Grants Commission (UGC) and wherever necessary

further regulated by the apex regulatory bodies such as Medical Council of India, Nursing Council of India, etc. in the country. To have standardized system for academic programmes and its courses of various disciplines it is pertinent to classify them in unique codes and develop a coding system.

The codes are built in the design and development of an academic programme system which in synchronize and act as a bridge between various types of services being rendered by various schools, divisions, units, and centres during the programme approvals of the statutory provisions of university. As such, the programme and course codes are assigned after the approval of the statutory bodies of the university and other official procedures for implementation of the said academic programme

The programmes and courses offered at IGNOU for university programmes are identified by subject area, the specialization abbreviation and number. Previously there was no uniform method of codification; different schools/disciplines employed different approaches in fixing the codes. Because of the above issues since the quantum of work was very huge and maintaining 3.0 million learners was a strenuous task, the programme and courses numbering/coding have been systematically classified for all the academic programmes and courses for all the Schools of Studies.

## **University Programmes**

Largely, the practice that is being followed by IGNOU, is based on two parameters viz. (a) the level of the programme and (b) the subject area of the programme. For example, PGDAE stands for Post-Graduate Diploma (PGD – indicates Post-Graduate Diploma – programme level) in Adult Education (AE stands for Adult Education – subject area) (IGNOU, 2000).

## **Programme Codes**

Programme codes are unique alphabetic codes assigned to programmes for identification purposes. Programme code can have a limited number of characters (usually not more than seven Characters). The alphabetical characters should identify certain parameters about the programme like the level of the programme, the subject area, the specialization features of the programme, etc.

The Programme code will have two parts consisting of alphabetic characters. The first part of the programme code should indicate the level of the programme, like Certificate-C, Post-Graduate Certificate-PGC, Diploma-D, Advanced Diploma-AD, Post Graduate Diploma-PGD, Bachelor Degree-B, Master's Degree-M, etc. if the faculty feels that the conventional

codes like M.A., M.Sc., M.Com., etc. is more convenient and meaningful, then they can be adopted without any modification.

The second part of the programme code should indicate the subject area of the programme like Food and Nutrition-FN, Rural Development-RD, Distance Education-DE, Computer Science-CS, etc.

- For Masters programmes:
  - M.A. in Economics \_ MAEC
  - M.Sc. in Computer Science \_ MSCCS
- For Diploma programmes:
  - Diploma in Economics \_ DEC
  - Diploma in Computer Science \_ DCS

### **Course Codes**

Course codes are unique alpha-numeric codes assigned to courses for identification purposes. Although there is no unique way of giving course codes, the course codes can have up to five to ten characters which are designed in such a way that one can easily recognize and memorize them.

The alphabetic characters can be designed in such a way as to identify; the academic units involved in the development of course; the course level (undergraduate degree / post-graduate diploma / postgraduate degree etc.); nature of the course (practical/theory/lab/project etc.) and any other parameter with which course can be easily recognized.

The numeric characters can be used to identify; whether a course is fresh or revised; the serial number of the course; the number of credits in the course (if desired) and the number of blocks in the course (if desired).

In practice, however, the course code should not be too short or too long. A short course code could not help in easy identification of the course. On the other hand, if it is too tedious it is difficult to understand, remember, and pronounce comfortably. The length of each parameter within the course code should also be optimized.

The code of a course should consist of two parts namely, (a) alphabetic part and (b) numeric part. The hyphen symbol “-” segregates the alphabetic and numeric part.

The alphabetic part will have two compulsory and one optional parameter. The course level; which is compulsory– one character width as per codes are given in Table 1

Discipline/area of studies code; which is compulsory – two characters width – some of the recommended codes are given in Table 2 and the last one indicating the nature of the course; which is optional – one character width – recommended codes are given in Table 3.

The Course codes have a course level code followed by discipline/area of studies code and nature of the course code. In other words, the course level code will prefix the discipline/area of studies code and the nature of the course code will suffix the discipline/area of studies code.

Table 1: Compulsory course level codes

S.No.	Programme/Course Level	Code
1.	Courses up to undergraduate level (like Bachelor's Degree etc. having entry qualification at +2 level).	B
2.	Post-Graduate level courses (like Post-Graduate Certificate /Diploma, Master's Degree etc.).	M
3.	Courses at the Research Degree level (M.Phil., Ph.D., etc.).	R
4.	Awareness Courses	N

Table 2 indicates the list of disciplines along with its codes. Furthermore, there are some areas of studies like tourism, women's empowerment, consumer protection, etc. developed by various disciplines. The code shall indicate each area of study and have a unique code reflecting the area of study. The list of disciplines/areas of studies left out (if any) and codes for future disciplines and areas of studies may be decided by the concerned discipline or area of studies in consultation with the nodal agency. The areas of studies along with recommended codes for some Schools are given in the Table 2.

Table 2: Compulsory discipline / area of study level codes

S.No.	School	Area of study	Code
1.	School of Agriculture	Agriculture	AP
2.	School of Humanities	English	EG
3.	School of Sciences	Chemistry	CH
4.	School of Social Sciences	Economics	EC
5.	School of Management Studies	Management	MS

Table 3: Optional nature of course level codes

S.No.	Nature of Course	Code
1.	Lab./Practical/Computing	L
2.	Project	P
3.	Elective	E
4.	Foundation	F
5.	Application oriented	A



If no code is indicated in Table 1-3, it is assumed that it is a theory course. Thus, a course at the level of Master's degree in Tourism Studies will have one of the following (alphabetic part) codes depending on the nature of the course.

MTS-indicates a course in Tourism Studies at the level of Master's degree (observe nature of course code is omitted).

MTSP-indicates a project course in Tourism Studies at the level of a Master's degree.

The three characters Numeric part shall indicate whether a course is fresh/updated (one character), and individual course number (two characters). The first character of the numeric part indicates whether a course is fresh (0 stand for a fresh course) or updated course (1,2,3,4,5,6,7,8,9, indicates the course is revised one in that order) followed by individual course number (two characters 01 to 99). Thus, a course at the level of Master's degree in Tourism Studies will have one of the following codes depending on the nature of the course.

- MTS-015 indicates that a course is: \_\_ at Master's degree level (M) \_\_ in Tourism Studies (TS) \_\_ it is a fresh course (0) \_\_ having serial number 15.
- MTSP-015 indicates that a course is \_\_ at Master's degree level (M) \_\_ in Tourism Studies (TS) \_\_ it is a project course (P) \_\_ it is a fresh course (0) \_\_ having serial number 15.
- MTSP-115 indicates that a course is \_\_ at Master's degree level (M) \_\_ in Tourism Studies (TS) \_\_ it is a project course (P) \_\_ it is first revision course (1) \_\_ having serial number 15.

The hyphen symbol “-” differentiates the alphabetic part and the numeric part to make the distinction and easy readability. Thus, in practice, a course code will have a minimum of seven characters and a maximum of eight characters.

### **Colour Scheme**

The Colour Scheme of a course is a unique colour or combination of colour coupled with design assign to the cover pages of the printed material (Blocks) for classification purposes. It is a uniform pattern of colour scheme for different programmes that differs from programme to programme, school to school, discipline to discipline but also within a programme, school, and discipline. The broad points for a colour should be that not too many colours as many people may not be able to identify and name the colour with marginal differences may be taken. For easy classification, the combination of colour(s) and design course material (blocks) and each University School can have a unique colour scheme.

The colour of a block may be standardized. Each school have been assigned a unique and distinct colour of the cover page of the blocks for all the courses/programmes developed by the school. The colour assigned to each school is shown in the Table 4. With future expansion some contrasting colours like teal, red, brown, blue-grey, olive-green, etc. can be used by in-consultation with the nodal unit.

Table 4: Colour Scheme

S.No.	School	Colour
1.	School of Humanities	White
2.	School of Management	Mustered Yellow
3.	School of Education	Navy Blue
4.	School of Engineering & Technology	Light Orange
5.	School of Computer and Information Sciences	Light Green

A nodal unit in the university may be established to coordinate and The Schools may seek Programme/Course Codes from it by furnishing the details of the proposed programme and course codes.

## **Benefits and Conclusions**

Earlier it was observed that in IGNOU there had been no acknowledged and effective coding system to systematically manage and monitor the various academic programmes and courses. So an effective classification and coding system have been designed and developed at IGNOU. The coding system has been implemented in over 1100 programmes and 5000 courses and it has been working efficiently. Since its inception, it has been catering to the educational needs of the university stakeholders that also include about three million learners.

This system is considered as one of the best practices that not only ensures integration but also effectively manage and monitor the university academic programmes and courses. This system related to the coding and classification has been facilitated to improve the quality, efficiency, and efficacy of the entire university system. It is inferred that the incorporation of such a classification and coding system into the institutional education system has streamlined and standardized the overall academic procedures and policies required for the efficient functioning of the university. Also, it removes any ambiguity that may arise in providing data and information while communicating with its learners or stakeholders including internal and external personnel associated with the university administration. The presented classification and coding system handles effectively the functional pressures involved in the timely delivery of various academic services. The presented system has streamlined and optimized the activities efficiency related to the university operational divisions, student registration, evaluation, and the material printing department, etc. The registration of students, term-end examinations, entrance tests,

evaluation of project reports, and certification of their performances has now been catalogued as per the classification and coding system for the academic programmes and courses. The codification of these courses and the adoption of the standardized methods have helped to resolve the various issues related to the inventory management system and has also streamlined the overall working of the university education system. It is inferred that the incorporation of such a classification and coding system into the institutional education system has streamlined the overall functioning of the university academic programmes and courses. In addition, the coding system not only plays a prominent role in improving the overall efficiency of the university education system but also helps to provide quality education to its learners.

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## COUNSELLING IN TIMES OF THE CORONAVIRUS AND BEYOND

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### Abstract

The current corona pandemic is changing everything – how we live, how we work and also how we learn. The field of career guidance has also been strongly impacted by restrictions in face-to-face counselling. These surrounding influences have promoted digitisation in this professional field. However, it is questionable whether the extrinsic coercion of COVID-19 alone and the need for economic survival will make digitisation trends in the counselling sector sustainable. Studies such as the “ICF Global Coaching Study” (2016), carried out before the pandemic, show that digital tools are still rarely used in counselling scenarios. Therefore, this article deals with the key question of how a target group specific e-learning theory can support the intrinsic motivation of counsellors to utilise digital content and methods. To answer this question, a situation and needs analysis of counsellors is presented, which was carried out as part of the Erasmus+ project ACCEnT (Accelerating coaching and counselling through e-Tools and innovative training). The project developed an innovative online course, focused in particular on the phenomenon of “hard-to-reach groups” within career guidance and previously underutilised digital tools to support them. A total of 84 career guidance counsellors in Germany, Portugal, the United Kingdom, Ireland and Finland were surveyed by means of an online questionnaire and 19 career guidance counsellors by means of a personal (face-to-face) interview. The situation and needs highlighted a professional profile of counsellors that is particularly characterised by their own experience as a success factor in their professional work. The e-learning course takes up this aspect with the help of David Kolb’s experience-oriented approach and thus attempts to legitimise a pedagogical framework that reflects the intrinsic motivation of counsellors and provides impulses for the perpetuation of digitisation tendencies.

**Keywords:** Coronavirus pandemic; Counselling; e-Learning; Experience-oriented learning; Erasmus+

## **Introduction**

In complex modern societies, the importance of counselling, coaching and guidance as a provider of orientation is increasing. Digitisation offers new tools and methods in counselling situations to help people enter the labour market. In particular, there is still unused potential for vulnerable communities, so-called “hard-to-reach groups”.

The term “hard-to-reach” is used to designate certain groups of people who are very difficult to reach with existing educational and counselling services because either no services are available for these groups or they cannot access available services (Shaghghi, Bhopal, & Sheikh, 2011). In most cases, it refers to underserved minorities in the population, whose needs and views may differ from the mainstream and who, therefore, may fall through the social safety net. These may be for example early school leavers, the long-term unemployed, NEETs or migrants, refugees or asylum seekers.

Hard-to-reach groups are represented in all countries of the European Union (Kasi & Saha 2019). By addressing the needs of vulnerable groups, guidance aims to support social inclusion and strengthen the European labour market by providing the workforce needed. Erasmus+ projects have recognised this important role of guidance in the European labour market. For this reason, they are given special consideration in key actions (e.g. European Commission, 2020).

Particular attention is being paid to the digitisation of guidance, as it has hidden potential to integrate hard-to-reach target groups into the labour market. E-Tools can provide significant support to these target groups in particular, by helping with professional orientation, the creation of competence profiles, the job application process and the strengthening of soft skills and mental health.

These opportunities were highlighted in the pandemic. Instead of face-to-face meetings, digital tools and online counselling increasingly had to be used in order to reach clients. However, it is questionable whether a pandemic alone will be sufficient to support digitisation trends in the long term.

This becomes particularly apparent in the pre-corona discourse of guidance, which can be characterised primarily by a sceptical attitude towards digital tools and online counselling. The results of the “ICF Global Coaching Study” (2016), a global survey conducted by the International Coach Federation (ICF), confirm that the use of digital methods in coaching has so far been rather restrained and that a face-to-face setting is the standard. Weighing up advantages against the disadvantages is at the forefront of the discussion (e.g. Menovshikov, 2010; Speyer & Zack, 2003). It is often neglected that digitisation has become an integral part of society and the everyday life of clients. This increasing digitalisation

cannot, therefore, be ignored by counselling services if they want to reach clients effectively on a permanent basis – especially when it comes to hard-to-reach groups.

The corona crisis and the increasing digitalisation of clients' lives as well as the untapped potential of digital tools form the foundation of the ACCEnT project. The Erasmus+ project wants to motivate counsellors to deal with new digital methods in their professional work. The project focused on the key factor of the counsellors themselves and the development of an innovative online offer. At the centre of the project is how innovative knowledge about hard-to-reach target groups and the use of e-Tools can be communicated to counselling professionals in a didactically appropriate way by means of an e-learning offer. It makes clear that the digitisation of counselling should not only be based on the extrinsic pressure of the corona crisis but also on increasing the effectiveness of counselling for clients - especially if they are classified as hard-to-reach. The key to digital sustainability must therefore, be found in a pedagogical approach that takes into account the needs and learning preferences of counsellors in order to intrinsically motivate them to engage with digital settings, both now as well as in post- COVID-19 times.

Hence, this article investigates the following research question:

- Which e-learning theory can support the intrinsic motivation of counsellors to deal with digital content and methods?

## Method and Sample

In order to evaluate the training needs and situation of career guidance counsellors working with the target groups described above, the ACCEnT project carried out a cross-sectional analysis based on quantitative and qualitative methods in the initial stage in 2019. A total of 84 career guidance counsellors in Germany, Portugal, the UK, Ireland and Finland were surveyed by means of an online questionnaire and 19 career guidance counsellors by means of a personal (face-to-face) semi-structured interview. A total of 103 counsellors participated in the research.

Table 1: Sample size of guidance practitioners who participated in the ACCEnT research, per country (number and %)

Country	Surveyed		Interviewed	
	n	%	n	%
Germany	11	13.1	4	21.1
Portugal	13	15.5	4	21.1
U.K.	14	16.7	4	21.1
Ireland	26	31.0	4	21.1
Finland	20	23.8	3	15.6
Total	84	100.0	19	100.0

The survey focused on an analysis of the counsellors' situation, i.e. socio-demographic data (age and gender), professional background, qualifications, further training, current work situation, institutional and professional profile. The next step was to collect the training needs: working difficulties and challenges, training needs and professionals' motivation regarding work with hard-to-reach target groups (long-term unemployed, early school leavers, NEETs, migrants, refugees and asylum seekers). The final step was to determine the learning content and preferred learning environment for the online training to take place.

The semi-structured interview focused on perceived key characteristics and challenges with hard-to-reach target groups, strategies and digital tools used, and skills and competencies needed in everyday work.

Each project partner from Finland, Germany, Ireland, Portugal and the UK applied both methods while conducting the study during two months at a national level. The quantitative data was collected through the ILIAS platform in February 2019, followed by the collection, audio-recording and partial transcription of the qualitative data which was gathered either in person, over the phone or via Skype during March 2019. All data was later subject to a country-specific analysis by each partner, and then all five national reports were integrated into a transnational report to expand the knowledge about the present situation and needs of European guidance practitioners working with hard-to-reach groups.

## **Results**

Most of the guidance practitioners surveyed in the five European countries were female (77%), having only 19% of the respondents declared to be male, and 4% chose not to disclose their gender. Regarding the age groups of the ACCEnT survey almost two thirds of the people surveyed (64.3%) were over 40 years old. 27.4% of the participants were 50 years or older. The survey results indicate that the majority of guidance practitioners working with hard-to-reach groups in the five European countries have Master's degrees (39%) in a wide range of subjects and areas such as Counselling and Guidance, Educational Guidance, Cultural Studies, Pedagogy and Social Pedagogy, among others. In general, counsellors are very well qualified and have completed a variety of further training courses.

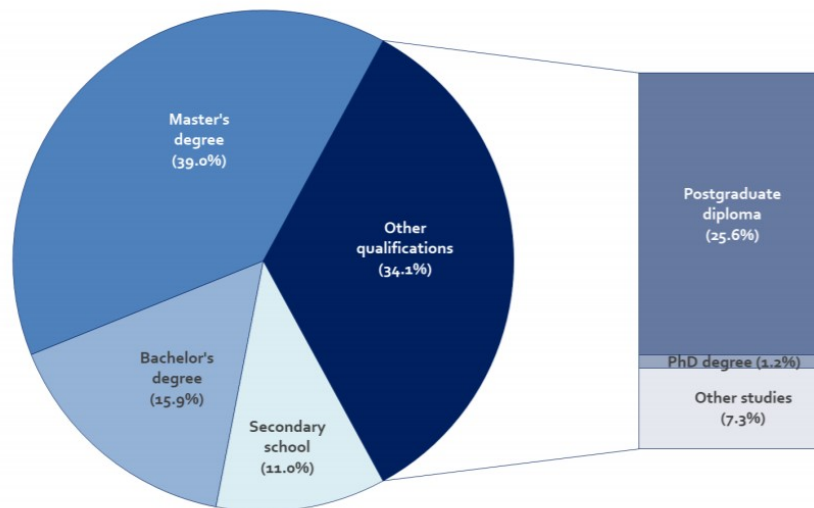


Figure 1. Education levels of guidance practitioners (%)

In addition to their own training and further education, respondents considered their own wealth of experience as a success factor in their professional work, and possible exchange of experience with colleagues as a motivator for participation in an online course in the interviews conducted. This informally acquired knowledge was also defined as a success factor for effectively placing hard-to-reach target groups in the labour market. The findings correspond to the results of the “2016 ICF Global Coaching Study”, where the average age of the coaches surveyed was 54.4 years (men) and 51.7 years (women). The target group is therefore characterized by a high level of life and work experience.

Thus Strasser's thesis (2006) that counselling is created between the application of knowledge and the experience-based reconstruction of theoretical concepts can be supported. Apart from a multitude of findings, the results of the survey were decisive for the design of the e-learning course and the theoretical foundation of the didactical approach.

On the basis of the needs assessment, a pedagogical framework and a set of flexible competences could be defined, which can be considered essential for counsellors working with hard-to-reach groups. The e-learning course is focused on the transfer of knowledge about hard-to-reach target groups, coaching techniques, increasing intercultural competence and the use of e-Tools in the counselling and communication processes. The methodological approaches, the course model, the requirements for the e-learning environment and the competence-based curriculum were designed according to the identified situation and the needs of the counsellors. The analysis phase enabled learning objectives to be set and the learning environment to be adapted to the learners' existing knowledge, skills and interests.



## Discussion

Due to the emphasis on one's own experience, the theory of David Kolb – leading advocate and promoter of the practice of experiential learning – was chosen as the basis of the pedagogical framework. Kolb's theory can be seen as an important approach to how counsellors learn. Kolb (1984) assumes that experiential learning follows a cycle of four steps.



Figure 2. Kolb's experiential learning cycle

Kolb defines learning as “a process in which knowledge is built through the transformation of experience” (1984; p.38). For Kolb, learning is not so much about the acquisition or mediation of content, but rather about the interaction between content and experience, which are mutually transforming. In his opinion, the task of the educator is not to impart knowledge or “implant” new ideas, but to change old ideas that might prevent new ones.

Experience-based learning is particularly interesting for guidance practitioners because it includes formal learning, informal learning, non-formal learning, lifelong learning, incidental learning and learning at work. It is based on a number of assumptions about learning from experience. These were identified by Boud, Cohen, and Walker (1993) as:

- Experience is the basis and incentive for learning.
- The learners actively construct their own experience.
- Learning is a holistic process.
- Learning is socially and culturally constructed.
- Learning is influenced by the socio-emotional context in which it takes place.

The online format of the ACCEnT course takes up these basics in several places with the support of videos and multimedia units in the learning materials which illustrate typical problem situations, case studies and examples from the daily work of counsellors.

In a first step, the counsellors existing problem-solving skills and wealth of experience are activated by means of reflective questions/questioning. This enables them to actively and consciously look back and reflect on their experiences and consider what is working or failing. The daily work routine thus becomes a space of experience, which is observed and analysed by means of self-reflective questions. According to Dewey (1938), only reflection, i.e. the intensive thinking about problematic situations arising in everyday life, leads to instructive experiences and thus to the expansion of a person's knowledge. Only after this activation follows the presentation of the concrete learning unit with new methods, theories and tools. Finally, a second process of reflection takes place in which old assumptions can be replaced by the newly acquired knowledge, which should lead to lasting change and improvement of everyday counselling.

A key element of experience-based learning is therefore that counsellors proactively analyse their experiences by reflecting, evaluating and reconstructing them (partly individually, partly collectively with the help of a "Community of Practice ") in order to draw meaning from them in comparison with previous experiences. This review of experience can lead to further action and an improvement in daily work. The e-learning environment therefore supports this process of reflection and self-evaluation in the sense Kolb's experiential learning cycle.

## **Conclusion**

Attractive and modern learning materials for career counsellors are needed for high-quality and up-to-date further training – especially with regard to the integration of hard-to-reach target groups into the labour market. A choice that corresponds to learning preferences can be crucial in motivating learners of specific professions. The suitable theoretical basis can thus promote the intrinsic motivation of counsellors to deal with new theories and digital tools in their work. These impulses are therefore not determined by "necessity" due to the corona pandemic, but by "volition" due to the added value of the learning material design. In this way, permanent and sustainable changes can be anchored in certain professional areas such as counselling and lead to the establishment of successful digital methods. While the choice of Kolb's learning theory takes into account motivational aspects of the learning materials, the classification of the materials as an Open Educational Resource (OER) supports their widest possible dissemination.

The provision of the course as a free OER is intended to make knowledge on this topic available to as broad an audience as possible and to expand the portfolio of – currently still few – learning materials. According to UNESO (2019), OER learning materials have the potential to improve the quality of education and to promote dialogue, knowledge dissemination and capacity building. They are intended to promote inclusive, equal

opportunity and high quality education and guarantee opportunities for lifelong learning worldwide. In this way, knowledge can be made available more quickly, more up-to-date and with greater equality of opportunity, and can be disseminated in an innovative way using new formats and technologies.

OER courses such as the Erasmus+-funded ACCEnT project can therefore be a long-term tool for training counselling staff in the effective placement of hard-to-reach groups in the labour market and, especially with regard to the European context, for generating a common quality standard – not only for Germany, but also for the participating countries Finland, Portugal, the UK and Ireland.

The viability of the approach will only prove itself in post-corona times. Here, not only cross-sectional studies but also longitudinal studies can determine whether the motivation of counsellors towards digitisation can be stabilised with the right pedagogical approach.

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## EDUCATIONAL INFLUENCERS – WHAT CAN WE LEARN FROM THEM?

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### Abstract

Social networks have positioned themselves in today's society as the means through which teachers interact, communicate and share knowledge. The aim of the present study was to explore the format and contents present in Twitter publications that Spanish “educational influencers” use in their interaction with their followers. This investigation presents a qualitative design with a sample of 10 Spanish influencers of the educational scope, who were selected for having over 15,000 followers and over 5,000 tweets published. A qualitative analysis based on an inductive system of categories revealed that the topics that are most frequently addressed by these influencers are the complaints, concerns and reflections of teachers in online teaching, teaching strategies, activities and learning resources.

**Keywords:** Educational influencer, Social networks, Web 2.0, Informal learning, Educational technology, Social influence, Teacher training, Connected learning, Self-regulated learning.

### Introduction

It is a very well-known fact that digital technologies have evolved exponentially throughout the years. Mobile devices, by incorporating recent technologies that make our everyday life easier, have evolved as much as the digital spaces and social networks through which we move and communicate nowadays, constituting a significant percentage of our leisure time. These also have an important influence on the way in which knowledge is disseminated, thus generating new spaces for learning. This is known as informal learning, i.e., activities that involve the search for knowledge, understanding or abilities that take place without the intervention of curricular criteria imposed on teachers (Moore & Klein, 2020).

Eraut (2004) highlighted that, unlike formal learning, informal learning has been poorly studied due to some characteristics that make it difficult to analyse. Other authors have

also analysed the influence of informal learning provided by teachers on the learnings acquired by students (Lai & Smith, 2018), as well as the effect of this type learning on teachers' professional development, understood as continuous teacher training (Vezne & Günbayi, 2016). The possibilities of self-regulated learning nowadays have multiplied. As is already known, any person with access to the Internet can learn anything they need, and not only in front of a computer, but through mobile devices (Sha, Looi, Chen, Seow, & Wong, 2012).

Recent studies have focused on analysing how and why teachers use social networks both for their professional development, and to establish contact networks between other teaching professionals or affinity spaces (Barton & Tusting, 2005). Recently, analyses carried out on the social network Twitter have made it possible to investigate some of the topics or hashtags that are most frequently used in the educational and academic sector (Carpenter et al., 2020). Twitter is not the only social network analysed. Other studies have sought to analyse how teachers make use of social networks such as Facebook (Hart & Steinbrecher, 2011) and Twitter (Smith Risser, 2013). These studies focus on analysing, mainly, how social networks have become established as spaces for support and collaborative work between teachers (Kelly & Antonio, 2016). We also find, with increasing frequency, studies that search the social network Pinterest for a space in which more and more teaching professionals share their work, their materials and ideas to take to the classroom (Schroeder et al., 2019).

It has been demonstrated that social networks, such as Twitter and Facebook, are meeting environments for people interested in learning a specific subject or field. Shen, Kuo, Ly, and Thi (2017) identified educational influencers and trends in social networks such as Twitter and Facebook by extracting information from their publications; they found that Twitter had the greatest frequency and amount of interactions compared to Facebook (Rehm & Notten, 2016). Carpenter, Morrison, Craft, and Lee (2020) also studied the messages on the Instagram network. On the other hand, van Bommer and Lijekvist (2016) conducted a three-year-long study focused on showing the behaviour of math teachers in social networks; they confirmed that Facebook is still popular among teachers as a medium for their professional teaching development. Specifically, they showed 9 groups analysed in Facebook, each consisting of 2,000-11,000 members, which is a considerable number taking into account that they were private groups.

Therefore, we began this study by posing the following questions:

- What educational activities are carried out by educational influencers?
- What is the type of digital content produced by these influencers that generates the greatest popularity and interaction between their followers?

## **Methodology**

This paper analyses the behaviour and interaction generated by a sample of individuals in Twitter who had a set of common characteristics in this social network. Twitter is one of the social networks with the largest number of followers nowadays, with 340 million users.

To analyse the profiles of the individuals that constitute our study sample, the Buzzsumo software was used, which is an online marketing analysis tool that allows carrying out advanced searches of people, profiles and most consumed and shared themes in the Internet, mainly in social networks. This tool allowed us to select a sample of influencers who represent profiles of high impact on their followers with their publications and interactions. Specifically, we focused on analysing profiles in Twitter, since it is a social network in which a large number of “educational influencers” converge. The analysis conducted through Buzzsumo was based on the following process:

44. Creation of an account using the Buzzsumo tool.
45. Screening of users in Twitter by keywords present in their biography and in their publications in this social network. The keywords used to conduct this classification were: Teaching, Iamateacher, Education, School and Learning.

After the analysis conducted through Buzzsumo, we obtained a sample of 64 educational influencers who were present in Twitter, of whom we analysed the 10 most representative influencers. We considered as representative profiles the ones with over 15,000 followers in Twitter and over 5,000 tweets published. The analysis of these influencers generated a category system that allowed establishing common criteria of such individuals in their interactions and publications, which were selected using the Buzzsumo tool.

To facilitate the subsequent analysis, the individuals were labelled in the following manner: Influencer 1. @xarxatic; Influencer 2. @ScientiaJMLN; Influencer 3. @Manu\_Velasco; Influencer 4. @maestrade pueblo; Influencer 5. @unicoos; Influencer 6. @smoll73; Influencer 7. @salvaroj; Influencer 8. @ftsaez; Influencer 9. @edusadeci; Influencer 10. @AyudaMaestros.

## **Information gathering procedure**

Once the sample of 10 individuals was selected, a mass extraction was conducted, obtaining the last 3,200 tweets of each of these influencers in Twitter. These 3,200 tweets were distributed in an approximate period of 6 months, with differences between influencers in the number of tweets. The data extraction was carried out using the Google Chrome complement “Twlets”, which allows exporting to an Excel worksheet up to 3,200 tweets of users in this social network.

We obtained a total of 32,000 publications from the selected individuals, which were then categorised. To this end, a category system was inductively developed, which allowed classifying the type and content of the publications generated in Twitter. The aim of this analysis was to specify which contents and formats are most frequently used by educational influencers to generate this interaction with their followers.

## **Category system**

Due to the lack of studies in this topic, we developed an inductive category system, following the steps described below for the creation of the categories, as recommended by Miles and Huberman (1984):

46. Reading of all the extracted tweets from each of the 10 selected influencers;
47. In parallel to step 1 reading, initial labelling of the topics that appeared;
48. Grouping of the topics based on theme similarity;
49. Definition of the categories;
50. Application of the category system to an initial sample,
51. Filtering of the category system;
52. Final category system;
53. Redefinition of some categories during the data analysis process.

The final category system consists of two dimensions: (a) Type of generated publications and (b) Content of the generated publications. Regarding the second dimension, we classified up to 9 categories that refer to the content tackled in the analysed publication: (a) Personal view, which refers to personal and individual aspects of the influencer; (b) Inclusion and diversity; (c) Emotional and affective education; (d) Subjects and contents; (e) Privacy and safety; (f) Innovative methodologies; (g) Teaching innovation; (h) School management and (i) Teaching.



## Data analysis

We conducted a data analysis that addressed the content of the publications related to several elements. Firstly, we find personal view, which is characterised by publications that contain reflections, opinions, personal acknowledgements, recommendations, collaboration messages to other teachers, and anecdotes or experiences. These publications contain rather personal messages, and they are aimed at impacting followers by showing subjective positions toward a specific topic related to education.

Table 1 shows that the most frequent item is that of objections (35%). This item is also one of the most striking in this study, as it shows expressions such as the one presented by Individual 4 (@maestrade pueblo) “Will we have to teach in the school yard? –Well, you will be allowed to go inside a pub very soon”, or “I see you complaining a lot about the digital competence of students these days”.

Table 1: Results in the category of personal view

Personal view	Infl 1	Infl 2	Infl 3	Infl 4	Infl 5	Infl 6	Infl 7	Infl 8	Infl 9	Infl 10
Help and collaboration	11%	6%	31%	5%	17%	14%	6%	14%	1%	27%
Publicity	4%	16%			12%					4%
Reflections	22%	20%	30%	13%	18%	16%	41%	37%	10%	7%
Objections	51%	33%	38%	60%	12%		20%	35%	8%	
Interviews		6%				5%	7%		6%	
Acknowledgements	7%	35%	16%	6%	4%		15%	5%	18%	20%
Anecdotes and experiences	5%	3%	2%	6%	7%	6%	4%		11%	24%
Advices	14%		6%		8%	69%	10%	4%	1%	
Curiosities		5%			17%				34%	
Humour	2%			36%					13%	
News about education and policies	25%	13%	13%	38%	22%		10%	17%	12%	18%

Following the most frequent subcategories, we find the item related to reflections (22%). This item has comments such as “We are living an epidemic of critical thinking decline, that’s why fake news are growing” and “Today we must and can only teach through happiness”.

The next item was related to the publications about inclusion and diversity. Table 2 shows that the influencer with the greatest contribution including contents about inclusion and diversity was Influencer 8 (@ftsaez).

Table 2: Results of the category of inclusion and diversity

	Infl 1	Infl 2	Infl 3	Infl 4	Infl 5	Infl 6	Infl 7	Infl 8	Infl 9	Infl 10	TOTAL
Inclusion and diversity	18%	3%		3%	2%	3%	3%	52%	16%	2%	100% (3,776)

There are also messages related to the application of some methodology considered as innovative, such as gamification, visual thinking, augmented reality, mixed reality, virtual reality, robotics and Big Data. Table 3 shows the publishing frequency of each of the analysed individuals, a topic that has been present in all their contributions, although not

# Educational influencers – What can we Learn from Them?

in a remarkable way “How to teach the verb tenses through cooperative learning” (Influencer 6, @smoll73).

Table 3: Results of the category of innovative methodologies

	Infl 1	Infl 2	Infl 3	Infl 4	Infl 5	Infl 6	Infl 7	Infl 8	Infl 9	Infl 10	TOTAL
Innovative methodologies		9%	15%	7%	5%	23%	5%	22%	6%	7%	100% (2,487)

After this item, we analysed messages related to teaching innovation in environments associated with teacher training and digital competence. Table 4 shows that the field of teachers’ professional development was approached in 64% of the tweets by 7 of the analysed influencers. Regarding educational technology, 59% of the tweets of 7 influencers contained comments related to this topic.

Table 4: Results of the category of teaching innovation

Teaching innovation	Infl 1	Infl 2	Infl 3	Infl 4	Infl 5	Infl 6	Infl 7	Infl 8	Infl 9	Infl 10
Teachers’ professional development	80%	100%	55%	49%		67%	52%	40%		
Educational technology	74%		80%	78%	10%	33%	48%	60%		

Next, we analysed aspects related to school management, understood in terms of managing the courses, the schools, the beginning of the courses and the teachers that work in them. Table 5 shows the outstanding participation of Influencer 4 (@maestrade pueblo) in this category: “We need more substitute teachers to begin with students, more material resources, etc. Solution? Increasing the number of hours of some subjects”.

Table 5: Results of the category of school management

	Infl 1	Infl 2	Infl 3	Infl 4	Infl 5	Infl 6	Infl 7	Infl 8	Infl 9	Infl 10	TOTAL
School management	22%		5%	48%		7%	2%	7%	9%		100% (2,964)

Lastly, we approached a very representative category with respect to this study, i.e., teaching. This category refers to teaching strategies that teachers provide in their messages, aspects related to online teaching, learning videos, teaching design digital tools, etc. As is shown in Table 6, 46% of the tweets have approached topics related to online teaching, with Influencer 1 (@xarxatic) showing the greatest contribution to this topic in his posts: “Run away from Zoom!”, “not all students will be able to follow those wonderful online classes”.

Table 6: Results of the category of teaching.

Teaching	Infl 1	Infl 2	Infl 3	Infl 4	Infl 5	Infl 6	Infl 7	Infl 8	Infl 9	Infl 10
Online teaching	79%	84%	27%	31%	44%			72%	7%	26%
Videos about learning					60%			6%	78%	
Digital tools	37%		61%	26%	4%	12%		2%	7%	39%
Learning activities and resources	21%	50%	31%		18%	22%		7%	15%	37%
Teaching strategies	10%			10%	3%	65%	53%	2%		
Curriculum							17%	6%		
Evaluation	13%	5%	14%	59%	13%	6%	31%	14%		11%

## **Conclusions**

Throughout this paper, it was observed that the content generated in social networks by individuals with the capacity to influence others can be considered as an opportunity to create new spaces for the exchange of knowledge and learning.

Regarding the categories with greater space, time and importance in this study, we must mainly focus on two. The first category refers to the personal view of the educational influencers on their perceptions, reflections, objections and acknowledgements. The second category refers to teaching, which showed concerns and reflections of teachers about complex aspects such as online teaching, teaching strategies, learning activities and resources, and the evaluation of learnings.

The main objective of this study was to determine the type of content and elements that were present in the publications of the 10 educational influencers with greatest impact at present. Elements such as objections, educational technology, reflections, subjects and contents, digital tools, and emotional and affective education were topics that appeared frequently in our analysis and will be studied in future research lines.

Knowing how each of the influential teachers are and what they share helps us to better understand how these informal structures of learning appear and consolidate in digital environments.

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## THE USE OF BADGES AND ITS IMPACT ON THE INTERACTION DYNAMICS OF A MOOC

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### Abstract

Several research projects have been using gamified approaches as a way to develop media and information literacies in particular cohorts. Badges are one of the elements that is often used in these approaches and its importance and scope has been widely discussed in the realm of Educational Technology. In the scope of the GamiLearning project, a gamification strategy was designed using the badges' engine of the SAPO Campus platform in order to provide continuous training in this field to a group of teachers. The particular training action reported in this article was implemented via the "Badges: how to use?" MOOC. Data obtained shows that the interaction dynamics patterns were very significant between the trainees, especially in terms of posts, comments and endorsements. These results suggest that the use of badges as a motivational asset can contribute to a more sustained engagement of students throughout the duration of the training action and, hence, to a greater ratio of completion of MOOCs. This article will present the data obtained in this MOOC and will promote a discussion about the motivational affordances of the use of badges in educational contexts.

**Keywords:** MOOC, badges, motivation, teacher education

### Introduction

Gamification is a term that has been pervading the educational jargon in the last few years. In fact, it has been so used in the educational field that researchers have found worth producing meta-analysis and systematic mapping studies (Dicheva & Dichev, 2015) about it. Studies analysed indicate that "gamification in education is still a growing phenomenon, [but] the review reveals that (i) insufficient evidence exists to support the long-term benefits of gamification in educational contexts; (ii) the practice of gamifying learning has outpaced researchers' understanding of its mechanisms and methods; (iii) the knowledge

of how to gamify an activity in accordance with the specifics of the educational context is still limited” (Dichev & Dicheva, 2018; p.1).

From our point of view the last point is very serious because it impacts the previous ones. The literature points out that this is a growing concern by educational agents that feel the need to innovate in their classrooms, especially to engage and motivate students in learning activities, but do not have the proper tools and, most importantly, they lack the knowledge to do it. This implies it is needed not only to gain knowledge about gamification, but, foremost, about how to design and apply it in specific contexts (Cózar-Gutiérrez, Sáez-López, 2016).

The gamification term is highly disputed. While it has been consistently used for the past 10 years, there is not an agreement in the literature about its definition and several claims have been made about its nature, boundaries and utility. One of the most cited definitions states that “(...) the use of game design elements in non-game contexts” (Deterding et al., 2011). This apparently simple sentence, however, encloses a great complexity. In order to use these game design elements/components in their activities, practitioners need to know them in detail, distinguish them from other game-related terms such as game mechanics, dynamics, aesthetics (Hunicke, LeBlanc, & Zubek, 2004) and know their strengths and weaknesses. Badges are one of the aforementioned game design elements. Several studies report the use of these elements in educational activities, usually to recognition, certification and assessment objectives (Gibson, Ostashevski, Flintoff, Grant, & Knight, 2015).

In this article we argue that the use of badges as a motivational element can be more beneficial and have a greater educational impact than the mere use of these elements as a recognition and validation tool.

### **Badges: definition and impacts**

Badges have been used for a long time as symbols that convey information about social origin and hierarchical positions (Halavais, 2012). Currently, a “badge is a symbol or indicator of an accomplishment, skill, quality or interest” (Mozilla Open Badges, 2014) and is also commonly associated to the concept of a reward in the context of games.

However, badges are much more encompassing in terms of its applications. In educational contexts badges can assume different functions related to certification, competition, achievement, identification, path orientation, recognition and reward (Araújo, Pedro, Santos, & Batista, 2018; Halavais, 2012). As their impact is directly dependent on the value that a community attributes them, there is a significant amount of previous work in order to determine the specific function that a community wants to highlight through the

attribution of badges. As put by Halavais (2012; p.369), “they can serve as a clear way of expressing what is valued by a community”.

According to a study by Aldemir, Celik, and Kaplan (2018, p. 246), badges are recognized as assets that can be fun, that can be used as a confidence-booster resource and a feedback agent, being important to learners’ self-assessment and that, used in a continuous and systematic way, “might function as a personalized motivator for the students at different skill, knowledge and interest levels (...)”.

## **The SAPO Campus platform**

SAPO Campus is a digital communication platform developed in the scope of a research and development partnership between the University of Aveiro and several partners of the Portugal Telecom/Altice group (Santos, 2016).

The creation, issuing and endorsement of badges is available in SAPO Campus since 2013. Any administrator may create badges and attribute them to members of the community that he/she thinks are deserving. Members can obviously accept or refuse the badge attribution and can also choose if the badge is visible only in that community context or publicly visible in his/her profile. The badge feature in SAPO Campus has an original functionality that cannot be found in other similar platforms: the possibility of endorsing members through badges. The main issue reported by members was not so much a technical difficulty of creating badges but an actual doubt related to the badge content and its smooth integration in the pedagogical planification of learning activities. Jovanovic and Devedzic, (2015; p.120) also identified this problem: “(...) anyone who ventures in building a non-trivial badge system will probably face a huge badge conceptualization problem: what are the achievements in a specific case, what to badge/reward, under what conditions, and, most importantly, how to chain and prioritize the achievements?”. The discussion of these results by the development team led to the decision to build a community in the platform that could provide examples and a discussion space in order to help SAPO Campus’ members who wished to use badges in their practices. This community assumed the form of a MOOC, entitled “Badges: how to use?” that is presented in the next section.

## **The “Badges: how to use?” MOOC**

### ***General description***

The “Badges: how to use” MOOC was conceptualized and offered in the scope of the GamiLearning research project as a way to train teachers in the general gamification field but more prominently to help them plan the use of badges. MOOCs are a way of providing accessible training opportunities so that teachers attending MOOCs would be able to adapt

to rapid changes that take place in the curriculum, in the school institution, in their own assessment and also in the available technologies (Kleiman, Wolf, & Frye, 2015). Having that in mind, a MOOC was considered as the adequate modality to offer this training action, aiming to reach different teachers, of all teaching levels and that would be interested in being active members of a learning community in this field, sharing examples, doubts and potential solutions regarding the use of badges.

The MOOC has begun on the 20<sup>th</sup> of April of 2017, lasted for 6 weeks and had 135 inscriptions. In terms of structure, the indications of Salmon (2003) were followed so the first week was an onboarding and familiarization one with activities that were designed so that members could know each other and also the SAPO Campus platform. During this week members were asked to register and explore the platform, edit their public profile and avatar, to complete a description about themselves and to use the task management tool available in the platform. Finally, members were invited to choose, from a set of badges created to that purpose, a badge to attribute to the presentations/descriptions made in the platform. In the end, the most voted badge would be issued. This particular task was designed to create some affinity between the community members and was very effective as many members not only voted and commented the presentations but also suggested possible situations in which those badges could be used. The following two weeks were dedicated to explore the conceptual aspects that support the use of badges and to present and discuss the state of the art of this field. The tasks suggested assumed the reading of some relevant studies together with some complementary research and information sharing activities. The next two weeks (weeks 3-5) were focused on application scenarios. MOOC participants were asked to conceptualize a badge system that could be used in their teaching activities. In these 2 weeks the nature of the work was essentially hands-on, supported by tutorials specially created for these tasks. The final week (week 6) was a reflexion week. Participants were asked to share some ideas about the importance of this training action, namely what could change in terms of their teaching activities with this new knowledge.

Participants in this MOOC were asked to read the available texts, to share examples they found or that they created related with the use of badges and to participate in the ongoing dialogue through their posts and comments. This typology of participation contributed to a very rich interaction dynamics between MOOC members. Being a MOOC about the use of badges that was its main focus and the activities that were planned were designed so that the participants, in a first instance as students and later as teachers, could feel the impact these elements can have in an online learning community. As mentioned earlier, the first task was to recommend a badge to the presentation of a MOOC participant colleague. Later, badges were issued recognizing the conclusion of a weekly task and the



participation in the synchronous sessions. In the badge creation phase participants could also create their own badges and issue them directly to their colleagues. These experiences allowed MOOC participants to experience and apply the concepts that were discussed.

### ***The MOOC's badge system***

A set of badges was created for this particular MOOC to reach the following objectives

- To promote the curiosity about badges and the interaction between MOOC members;
- To provide a rich contact experience with badges;
- To recognize and give feedback to the tasks performed by the members;
- To highlight important aspects related to the use of badges in the course of the activities;
- To certify the conclusion of the MOOC.

Table 1 presents a detailed description of the plan of badges attribution in the MOOC. It should be stressed that, at least, a badge was attributed each week, signalling the conclusion of that week's activities. Throughout the MOOC it was possible to provide to each member a direct contact with different types of badges, making it easy to bridge more conceptual issues with practical use that arise with the use of badges.

Table 1: "Badges: how to use?" MOOC activities and weekly attributed badges

Week	Main activities	Badge objective
1 <sup>st</sup>	Presentation To endorse a badge to attribute to each presentation	To provide a rich first experience with badges To identify MOOC members To promote interaction between MOOC members
2 <sup>nd</sup>	Readings and reflective comments on those readings To choose a badge from a pool of examples sharing the justification for that choice	To know about the conceptual framework underlying the use of badges Badge that recognizes the conclusion of the 2nd week activities
3 <sup>rd</sup>	Readings and reflective comments on those readings Sharing of ideas about the use of each badge type	To understand the several possibilities of using badges Badge that recognizes the conclusion of the 3rd week activities
4 <sup>th</sup>	Tutorial related to the creation of badges in different platforms To create a badge and share it in the platform Synchronous discussion about the work developed	To plan and to create a badge To promote the attribution of badges between the participants Badge that recognizes the conclusion of the 4th week activities
5 <sup>th</sup>	Create a badge system Synchronous discussion about the work developed	To plan a badge system Badge that recognizes the conclusion of the 5th week activities
6 <sup>th</sup>	Training evaluation Synchronous discussion about the work developed	To finish the activities To certify the conclusion of the MOOC through the attribution of an Open Badge

## **Method**

This study applied Social Network Analysis (SNA) metrics on all the interaction data extracted from the “Badges: how to use?” MOOC. This method allows the use of metrics that afford the study of interaction in online communities as well as its graphic representation through graphs and sociograms. In these, people are represented as nodes and the edges represent the connections between nodes (community members). Besides the graphical representation it is possible to extract metrics that are grouped in cohesion measures, measures of centrality and measures of formation of communities. For this article, the following metrics should be taken into account (Ferreira, 2016):

- Diameter – it represents the maximum distance between any two nodes in a graph.
- Density – it represents the cohesion level of a community and varies between 0 and 1. Communities with a density closer to 1 are more cohesive.
- Degree – it represents the number of ties each node has with other nodes in the graph. In-degree is a measure that counts the number of nodes directed to a given node and out-degree is the number of nodes a given node directs to.
- Betweenness – it represents the number of paths between nodes that pass through a given node.

Data collected corresponds to the notifications issued by the notification engine of the platform related with publications, comments, blog posts, favourite contents, file and image sharing, link publishing and badge endorsements and awards. Each register has information about the community member that was the source of the interaction, of the target member(s) of that action, as well as the date in which the notification was created and the type of interaction that it represents. We considered relevant to attribute different weights to each type of interaction. Hence, values between 1 and 135 were attributed taking into account that the community had 135 participants.

## **Results**

A csv file with the columns target, source, data, relationship type and weight was analysed, following the procedures of previous studies that used this method of data extraction from the SAPO Campus platform (Cabral, 2016; Ferreira, 2016; Pedro et al., 2016, Araújo et al. 2018). Using the Gephi application, a graph was then created (cf. Figure 3) using the Force Atlas 2 algorithm in which the edges that represent the interactions between nodes reflect the weight values defined. In terms of the distribution of the interaction by week/month, it is visible that interactional values were evenly distributed during the 6 weeks of the MOOC (cf. Figure 2). A peak in the “badge\_endorse” interaction type is visible in the beginning of the second week (20-26 April) that corresponds to the particular task that was to be completed in that date. This steady pattern somehow contradicts the phenomenon of

“funnel of participation” reported in some studies as there is not a decrease of participation throughout the different phases of the MOOC (Clow, 2013).

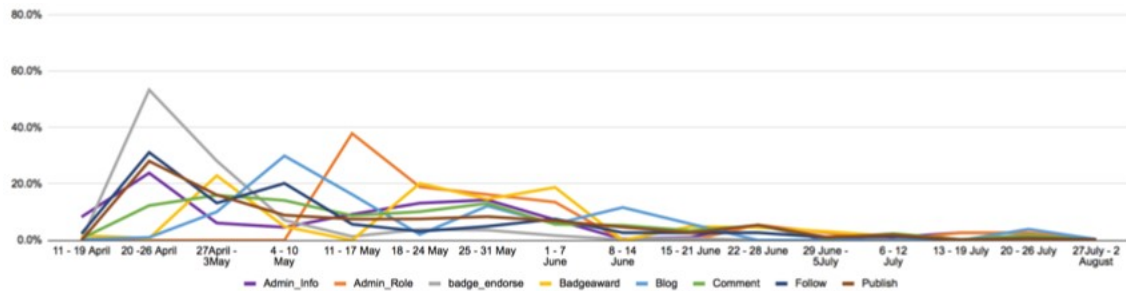


Figure 2. Evolution of the percentage of interaction types by week.

One interesting aspect is also related with a peak in terms of the “admin\_role” interaction type, beginning in the fourth week and until the sixth week. This peak matches the activity of planification of the badge system that implied a deeper engagement of the community members, namely in terms of sharing ideas and asking for advice. Generically, Figure 2 shows that the main interaction peaks were achieved in the weeks in which the planned activities implied a given action by the MOOC participants. This evolution of specific interaction types is also visible in a detailed analysis of the month of May (cf. Figure 3).

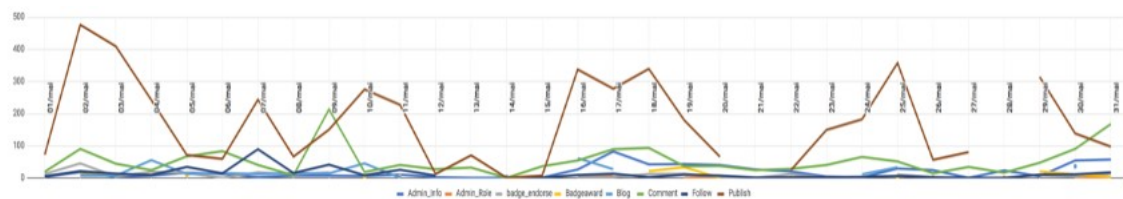


Figure 3. Evolution of the percentage of interaction types by day (May).

The peak moments are visible and match specific dates in which activities such as the delivery of outputs or synchronous discussions were scheduled. The peaks happen in successive days followed by a stagnation period (weekends), showing that interaction types such as “blog\_articles” and “comment” are somewhat restrained to workdays. This pattern is not very different from what is reported in other studies regarding interaction in MOOCs (Wong et al., 2015). The data obtained allows us to claim that socializing activities are more conducive to participation and interaction. More, strong values of interaction and engagement are particularly associated with motivational activities, such as the ones related with badges’ endorsement and sharing of ideas related to a potential badge system. In terms of social network analysis metrics, the values obtained show that this community has a diameter value of 2. This is a strong indicator of proximity between the participants as it means that from any node in the network it is possible to reach another node having only one node as broker of that connection. In terms of density, the network has a value of 0.448 showing an average cohesion level. Finally, the average degree of the network is 59.53

which means that, on average, each member of the community interacted with ~60 members.

## Conclusions

The results obtained in this study show that activities designed with the objective of motivating participants to interact in the learning community resulted in relevant levels of engagement. In terms of participation types, these activities included not only badges' endorsement activities but also discussions related to design thinking activities (creation of a badge system) and its connection to specific educational contexts.

When compared with other types of activities, such as guidance activities recurring to readings and tutorials, engagement levels were not found to be very high. One must be cautious in establishing a cause-effect relationship between the use of badges and the increase of motivation, however. The literature confirms that claim: “[a]lthough the connection between motivation and gamification design is demonstrated by a number of the reviewed studies, they do not add persuasive evidence confirming the effect of gamification as a motivational tool” (Dichev & Dicheva, 2018; p.12).

From our point of view this study shows that the use of badges as a motivational element in an educational intervention mediated by technologies can contribute to a more sustained engagement of students throughout the duration of that intervention and possibly generate interaction dynamics patterns conducive to better learning results.

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## **CONTRIBUTIONS OF THE RESEARCH LINE ON LITERACY AND DIGITAL INCLUSION OF WOMEN: OVERCOMING DIGITAL DIVIDES AND OBTAINING REAL BENEFITS IN THEIR DAILY LIVES**

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### **Abstract**

This research follows a trajectory of work in the field of women's studies and learning with digital technologies. The research is undertaken by the DIME HUM 833 research group from University of Seville (Spain). Extensive research projects have basically focused on: (a) characterize the processes of digital inclusion and know how women (with different profiles professionals, entrepreneurs, unemployed, students ...) learn with technologies and overcome digital divides (MAIA Project), (b) to value the processes of participation and learning in social networks and their influence on the subjective and emotional well-being of women (RURAL WOMEN Project). A third research in process is presented on the line (ALCMENA Project). The aim of this project is (c) describe the situation of middle-aged and older women in the Andalusian Digital Society and learn about their experiences with digital technologies.

Mixed-type research has been developed from a survey studies and qualitative studies based on techno-autobiographical interviews and thinking aloud protocols. The final sample was made up of 1340 women for the MAIA Project and specifically 478 in rural areas for the RURAL WOMEN Project.

The results show a moderate degree of digital inclusion of women. The results point to the research offers a detailed knowledge of the role that current digital technologies are playing in the lives of a wide diversity of women. The results show different learning ecologies from the women with different profiles. The results are shown in detail in the book Jiménez-Cortés et al. (2016).

At the same time, the research shows that participation in democratic processes online has the potential to improve the quality of life of women and gives them greater control over their lives and satisfaction. This knowledge allows women to prepare for an active and full digital citizenship, which brings them well-

being. The results are shown in detail in other papers (Jiménez-Cortés, 2015; 2016).

The expected results of the ALCMENA Project will show processes of digital empowerment and strategies of middle-aged and older women that serve as a reference to guide the actions of interested social agents and institutions.

**Keywords:** women's studies, digital literacy, learning, social media, well-being, digital divide

## **Introduction and justification of the research line**

Digital literacy constitutes one of the main political lines of action in Europe and Spain, mainly due to its repercussions on the digital economy. It is a key objective of the Digital Agendas for Europe and Spain. The National Plan for Digital Inclusion and Employability incorporates literacy as its main axis. The digital literacy is defined as the development of digital skills by the most vulnerable groups such as women (Jiménez-Cortés, 2016). The promotion of lifelong learning to develop ICT skills result a key matter of social justice for overcoming digital inequalities. These inequities have been documented by national (Menéndez, 2012) and international research (van Dijk, 2005).

The telecentre networks such as Guadalinfo in Andalusia (Spain) and their educational initiatives for digital literacy are a clear example of the political will to bring ICTs to different sectors of the citizenry. The finality is to break the first digital divide (related to with access resources to digital technologies (devices and connectivity) and the second digital divide (linked to skills and use (Castaño, Martín, Vázquez, & Martínez, 2009).

Current international research points to the existence of a larger number of digital divides overlapping (Hargittai & Walekjo, 2008; Hoffmann, Lutz, & Meckel, 2015; Jiménez-Cortés, Vega-Caro, & Vico-Bosch, 2016; Jiménez-Cortés, Ruiz, & Vega, 2016). This knowledge draws a complex landscape for the design of effective educational actions capable of mitigating digital inequalities. However, these political, social and economic purposes of using ICTs must necessarily translate into real benefits for women. These benefits, that can be derived from digital literacy processes, are of a very different nature. For example is a benefit for women the exercise of active digital citizenship (Jiménez-Cortés, 2016) or the implementation of online business ideas, the quality of life (García-Pérez, Jiménez-Cortés, & Rodríguez, 2013) and well-being (Jiménez-Cortés, 2015; 2016). This implies two great challenges for educational research: (a) to review and rethink the concept of digital literacy from the real experience of women. On the same lines, political strategies must be sensitive to new ways of learning about ICT, (b) it is crucial to identify the real benefits, that is,



tangible results that the digital inclusion processes are contributing to women in their daily lives.

### ***Research line objectives***

The research line on digital literacy and digital inclusion for women has been developing intensively in the last six years for cover different objectives, in relation with the challenges:

- Characterize the processes of digital inclusion and know how women of different profiles (professionals, entrepreneurs, unemployed, students ...) learn with technologies and overcome digital divides. This is the main purpose of MAIA project. Women as Weavers of Social Networks: Relational Strategies and Digital Inclusion State Plan 2013-2016 Excellence – R&D Projects (Reference: EDU201345134-P).
- To value the processes of participation and learning in social networks due to their influence on the subjective and emotional well-being of women. Under the project Relational Quality, Digital Immersion and Social Well-being from a Gender Perspective. An Application of Online Social Networks in Rural Andalusian Women. Projects of Excellence of the Junta de Andalucía (Reference: P10-SEJ-5801).
- Describe the situation of middle-aged and older women in the Andalusian Digital Society and learn about their experiences with digital technologies (Project presented at “R+D+i projects” universities and public research entities (BOJA No. 203, 10/18/2018) Research Projects Oriented to the Challenges of the Andalusian Society).

### ***Research methodology***

The methodological design is a mixed research. Thus, a survey-type descriptive method is combined with a more comprehensive, ethnographic, phenomenological methodological approach, which delves into the thoughts and experiences of women using interviews, think-aloud protocols and micro-audio-stories.

### ***Sampling procedures and participants***

Different samples are used for research according to objectives. The final sample was made up of 1340 women for the MAIA Project (women residing in Andalusia and Extremadura), selected from a sampling by quotas considering the employment situation (employed, unemployed, students, housewives and retired) and the age of the women (20 to 25 years, 26-34 years, 35-44 years, 45-54 years, 55-64 years, more than 65 years). Which represents an appropriate size for a sample error rate below 5% (with a confidence level of 95.5% and  $p = q = 50\%$ ).

The selection of women from rural areas (who use digital social networks) was carried out with a sample stratified by quotas, taking four age strata (18-25, 26-39, 40-54 and 55-65) and three strata depending on educational levels (no education/compulsory education not finished, compulsory education completed and university education) in the province of Seville. Which represents an appropriate size for a sample error rate below 5% (with a confidence level of 95.5% and  $p = q = 50\%$ ).

To deepen on a qualitative level, we selected a total of 30 women. A theoretical snowball sampling is followed to locate women who, meeting the established sampling inclusion criteria, have the maximum variability of profiles.

For de Alcmena Project the sample size is expected to be made up of 400 Andalusian women over 50 years of age with a sampling error of the global data close to  $\pm 5\%$  with a confidence level of 95% and  $p = q = 0.5$ . It is planned to carry out this selection of women through an incidental sampling by quotas according to age groups (middle age, between 50-65 years and older, between 65-90 years).

For qualitative phase the sample size is expected to be 40 women following a theoretical snowball sampling and a sampling of discrepant cases. The use of a tablet or iPad will be considered as the main inclusion criterion, since current research shows that it is the device that makes a difference in the access and use that women make of the internet (Lee & Coughlin, 2015).

### **Data collection instruments**

Quantitative data collection is carried out through the C.A.W.I. (self-administered interview by online computer) without the use of online panels and printed questionnaires are also used that collect different scales and measures, including:

- Scale on digital inclusion based in Bradbrook and Fisher (2004) and Helsper (2008). She obtains a Cronbach's alpha coefficient of .829.
- Scale on literacy and digital competence (Internet skills) based in van Deursen, Helsper, and Eynon (2014) and on technical reports from the UK government. She obtains a Cronbach's alpha coefficient of .871.
- Informal learning scale in networks (MAIA scale) (Jiménez-Cortés, 2019) based in Heo and Lee (2013) and Fenwick and Tennant (2004). She obtains a Cronbach's alpha coefficient of .948.
- Emotional well-being scale. This scale is based on an osgood-type semantic differential on a graphic scale from 0 to 10, the composite reliability is  $\rho_c = .9759$ .

Qualitative data collection is done using:

- Technological-autobiographical interviews include questions such as “When you have needed to go online to learn something quickly, where do you usually go (to web pages, to YouTube, to networks...)? What are the things you have been interested in learning about at certain times?”
- Thinking aloud protocols for women to collect information about their Internet connections, relating aspects such as, what has led them to connect, where they are and from where they access the Internet in the form of micro-audio-stories, pages you are browsing and why, difficulties,...

### ***Analysis procedures***

Exploratory analysis techniques are realized with the software SPSS v.23. The analysis uses the Partial Least Squares (PLS) techniques, designed for predictive analyses in which the problems explored are complex (Chin, Marcolin, & Newsted, 2003) and theoretical knowledge has not been consolidated (Barclay, Higgins, & Thompson, 1995), as is the case with well-being on digital social networks (Jiménez-Cortés, 2015). To do this, we used the Smart PLS 2.0 programme (Ringle, Wende, & Will, 2005).

For qualitative data, analytical techniques based on grounded theory, discourse analysis and thematic analysis using the ATLAS ti software. v. 6.2.

### ***Ethical implications of the research***

The research incorporates informed consents that require acceptance by women before proceeding to their participation. The collection of information is carried out under a confidentiality declaration by the people involved in the data collection and the analytical treatment procedure of the data is anonymized.

### ***Main results and value of contributions***

In relation with the first objective and the MAIA Project, the study of the digital inclusion of women, shows that 48.8%, (640 women) presents a moderate degree of digital inclusion. The advanced degree of digital inclusion is reached only by 36.1% of women. The study of the factors of digital inclusion (connectivity, confidence, participation) in isolation show the aspects in which women present more barriers to an effective use the digital technologies. We observe that 44.6% (490 women) show little digital confidence. The qualitative analysis reveals new explanations for digital inclusion. The women overcoming of barriers related to technical aspects and programming languages, overcome beliefs and emotional resistance to the online life, linked to feelings of shame, fear and lack of confidence.

The characterization of these digital inclusion processes has been the key contribution of this research, cataloguing and relating motives for use (Jiménez-Cortés et al. 2015), barriers and ways of overcoming digital divides. The relevance of the informal support network and the effects of the attitudes and behaviours of family, friends and / or the community explain the differences in literacy and digital inclusion. This result is key to changing the approach the politics strategies on digital literacy very focused on individual development of ICT skills that does not consider the context in which women are immersed. This new approach involves reconceptualising “digital literacy” from a more holistic point of view. It is essential to assess digital literacy proposals from a new approach more centred on the characteristics of the context and informal support networks of each woman.

At the same time, the research offers a detailed knowledge of the role that current digital technologies are playing in the lives of a wide diversity of women. The results trace different characteristic learning ecologies of women with different profiles. This knowledge helps to propose and design personalized learning routes for profiles and sensitive to their ways of learning (Jiménez-Cortés et al., 2017). This knowledge has a special impact on the content of orientation and professional development of the students, for example.

In relation with the second objective, the results obtained show the importance of social networks for the lives of women. And it is that, participation and relationships maintained in digital social networks positively influence the subjective well-being of women. The confirmatory empirical models obtained show that identity consistency has a direct effect on life satisfaction with networks. The informal learning processes (participation and relationships in virtual social networks) influence to identity (Jiménez-Cortés, 2015). The training initiatives, publics or privates, must incorporate the use of social networks and reorient the pedagogical design of these spaces in this sense. This approach on the techno-pedagogical design of virtual learning environments is important for women to obtain this personal benefit.

At the same time, the research shows that participation in democratic processes online has the potential to improve the quality of life of women and gives them greater control over their lives. This knowledge allows women to prepare for an active and full digital citizenship (Jiménez-Cortés, 2016).

The main value of these contributions is that they help guide public investment in digital literacy by adapting political strategies to women’s profiles and also improve the techno-pedagogical designs of training initiatives by incorporating social networks that respect the

identity of women, knowing that there are concrete digital practices on the network that have real benefits, such as well-being or the exercise of active and full digital citizenship.

We consider that the educational, political, social and economic strategies for the use of ICT, they must necessarily translate into real benefits for women.

### ***Future research line***

The ALCMENA Project arises with the purpose of describing the situation of women from middle-aged and older in the Andalusian Digital Society and learn about their experiences with digital technologies. To do this, it will investigate their literacy and digital inclusion, how exercise citizenship and digital empowerment (activities on the Internet and use they make of digital services), the myths they assume (beliefs and attitudes towards technologies digital) and the real benefits and quality of life that they report. The experiences of these women and their perceptions will help understand the ways they learn with technologies and how they bridge digital gaps. In short, we try to value your knowledge and experiences in order to offer strategies for social innovation especially aimed at this group and capable of promoting their inclusion in a society digitized as is the Andalusian.

Current research on digital living, show the relevance of the incorporation of certain sectors of the population to the use of ICT (Novo-Corti, Varela-Candamio, & García-Álvarez, 2014; Vergés, 2012). The older women require awareness and confidence towards the use of ICT, quality access to the Internet and digital skills that allow them to meet their health, training, entertainment, management needs with the public administration and the use of digital services. The ALCMENA Project promotes innovative proposals for the Andalusian Digital Society.

This project tries to deepen aspects such as literacy and digital inclusion, the exercise of digital citizenship and the processes of empowerment of women, myths, beliefs and attitudes towards ICTs and the real benefits they obtain and the quality of life. These study dimensions will be offering a clear understanding of the situation of Andalusian middle-aged and elderly women in this digitized society.

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## WIKIPEDIA IN UNIVERSITY PROGRAM: WHAT DOES THE META-ANALYSIS OF THE COURSES' PAGE TELLS US?

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### Abstract

Wikipedia is an unavoidable resource when we do a web search with the aim of obtaining information. Its content is built from a bottom-up perspective and for this reason it is not always accepted in academia. However, this is not the view of the Wikimedia Foundation. Thus, under the motto “Wikipedia belongs to education”, the Wikimedia Foundation has partnered with educational institutions through the Wikipedia Education Program, which includes the Wikipedia in University Program. Within this scenario, it was considered important to do the meta-analysis of the page related to the courses offered in the context of this program with regard to the Wikipedian Portuguese speaking community. For this purpose, methodologically, we followed the MAECC<sup>®</sup>, the Meta-model to Analyse and Explore Scientific Knowledge<sup>®</sup>. Our corpus includes 22 Higher Education institutions, 21 of which are Brazilian and 1 Portuguese – Universidade Aberta (Open University Portugal). In this text, we will present the meta-analysis grid created to meet the research aims, identifying the data obtained in all the 5 macro categories of the MAECC<sup>®</sup> model. In general, the meta-analysed courses are diverse and refer to dynamic practices and valid work strategies.

**Keywords:** Wikipedia, Wikipedia Education Program, Wikipedia in University Program, Meta-analysis, MAECC<sup>®</sup>, Knowledge Mapping.

### Introduction

Understanding the network as an educational interface that integrates and provides the opening and sharing of knowledge, according to Cardoso, Pestana, and Brás (2018), we redirect our look specifically to Wikipedia. This online encyclopaedia can be seen as a source of information through collaborative and anonymous writing, and through the self-regulation of the knowledge-building system. As Knight and Pryke (2012) refer, Wikipedia is a new and controversial topic in the history of education. Under the motto “Wikipedia



belongs to education”, the Wikimedia Foundation, an entity that financially supports several projects, including Wikipedia, has been betting on partnerships with educational institutions through the Wikipedia Education Program (WEP), which includes the Wikipedia in University Program (WUP) (Pestana, 2014; 2015; 2018). It is in this context that it was considered pertinent to meta-analyse the page related to the courses available in the context of the Portuguese-speaking WUP. For this, we methodologically use the Meta-model for Analysis and Exploration of Scientific Knowledge® (MAECC®).

The article is organized in three parts: The first is dedicated to the theoretical context where issues related to open education are worked and in this the open educational practices (OEP) and open educational resources (OER). The second part is dedicated to the methodological analysis system, that is, to MAECC®. Finally, in the last part, the data inherent to the identified problem are discussed and presented.

### **Theoretical contextualization**

Openness issues, particularly in the context of open education, are pressing. In order to illustrate this concept, polymorphic and polysemic, we used the perspective of Conole and Brown (2019), Cronin and MacLaren (2018) and Pestana (2018). For these authors, open education integrates individual and / or institutional resources, tools and practices in order to promote access, efficiency, success and equity in education in the world. In this context, we emphasize the essential role that OER and PEA play in that promotion. And we clarify that the PEA are understood as the combination of the use of OER with open architectures in the creation of learning environments (Ehlers & Conole, (2010). They conclude that “OEP means the use of OER and the opportunity to benefit from experiences and expertise of others”.

Concretely directed to Wikipedia while OER it is important to mention that in the context of the opening one of the winning proposals was the existence of OER, a reflection of this will be their sustained and progressive growth since 2009. These are currently seen as a natural path in the implementation of distance learning, open education and new pedagogical approaches (Pestana, 2014; 2015; 2018).

Taking Wikipedia as an object of study and as a pedagogical strategy, it is important to highlight that this issue has become increasingly present at different levels of education in the world, namely because the Wikimedia Foundation identifies as a priority the partnership with the various educational institutions, putting on the ground the initiative designated as the WEP and in this the WUP. In Portugal, this partnership was made with Universidade Aberta (UAb) through LE@D, Laboratory of Distance Education and Elearning, more recently, through the International Academic Network WEIWER® (Wikis, Education & Research / Wikis, Education & Research) which has promoted several

projects, studies and training on these topics, namely the one that is now being presented. According to Cardoso, Pestana, and Pinto (2019), WEIWER® was officially formalized in 2018 with Open Sessions, an annual event that fosters debate on issues associated with the Wikipedia phenomenon, and promotes and investigates a set of practices that embody their curricular integration at different levels of education. The next point is dedicated to the methodological system of analysis.

## **Methodological contextualization**

The research carried out, of which this text is an excerpt, aims to answer the following question: What does the meta-analysis of the course of the only Portuguese university tell us? Now considering the design used, it developed in an approach that combines quantitative and qualitative methods.

With regard to MAECC®, according to Pinto, Cardoso, and Pestana (2019), the systematization of knowledge, embodied in mixed or multimodal meta-analysis, allows combining document analysis from a qualitative and quantitative perspective to content analysis, privileging the theories proposed by van der Maren (1996), categorized according to the following levels: description, understanding, explanation and formalization of knowledge, which promote an appropriation of critical and reflective knowledge on the issues in question. It is important to clarify our understanding of meta-analysis, supporting, for this purpose, the perspective of Gene Glass, who in 1976 introduced the term for the first time. Thus, for Glass (1976; p.3), “[m] eta-analysis refers to the analysis of analyzes. I use it to refer to the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings”.

From the meta-analysis, we considered for our study, according to Cardoso (2007), the following procedural steps: (a) the selection and inclusion of all existing courses on the platform of the Wikipedia Program at the University; (b) the definition of inclusion and exclusion criteria, for the constitution of the corpus; (c) the development of coding categories, to cover most of the identified courses; (d) the analysis and graphic representation of the results and their distribution; (e) the combination of quantitative and qualitative reviews. Figure 1 systematizes the conceptual model built for our study, meta-analytical, in its various phases, which we describe below.



taught in this program in Portuguese. At the date of the corpus definition, the meta-analysis for the identified period was 2011-2018.



Figure 2. Screen of the “Courses” tab of the WUP page in Portuguese (<https://bit.ly/31jyHVv>)

Table 1: Corpus of (meta) analysis

Courses	Universities
1. Desenvolvimento de Software Livre	Universidade de S. Paulo (Instituto de Matemática)
2. Sistemas Multimídia	Universidade Federal do Estado do Rio de Janeiro
3. Tópico Especial em História Antiga - “A história romana na Wikipédia”	Universidade Federal do Estado do Rio de Janeiro
4. História da Cultura	Universidade Estadual Paulista
5. Eletromagnetismo	Universidade Federal do Rio de Janeiro
6. Espalhamento Elástico de Luz e Raios-X por Biosistemas	Universidade de S. Paulo
7. Política Cultural	Universidade de S. Paulo
8. Antiguidade Clássica	Universidade Federal do Estado do Rio de Janeiro
9. Memória e Vivência	Universidade Estadual Paulista
10. Curso de extensão	Universidade Federal do Estado do Rio de Janeiro
11. Direito Sanitário	Fundação Getúlio Vargas
12. Atividades Acadêmico-Científico-Culturais	Universidade de São Paulo
13. Cidade e Imaginário	Universidade de São Paulo
14. Química Geral e Experimental	Universidade de São Paulo
15. Equações Diferenciais	Universidade Estadual Paulista
16. Design e Editoração	Faculdades Integradas Rio Branco
17. Física III-C – Física para engenharia	Universidade Federal do Rio Grande do Sul
18. Literatura - Teoria e Crítica	Universidade Estadual do Sudoeste da Bahia
19. Sistemas de Produção I	Universidade Federal do Paraná
20. Tópicos Especiais em Biologia Evolutiva	Universidade Federal do Espírito Santo
21. Língua Latina 2	Universidade Federal do Espírito Santo
22. Evolução	Universidade Federal do Espírito Santo
23. Introdução às Tecnologias da Comunicação	Universidade Federal Fluminense
24. Antropologia e Sociologia - Grandes Pensadores Brasileiros	Universidade Federal do Rio de Janeiro
25. Eletromagnetismo II	Universidade Federal do Rio de Janeiro
26. Seminário de Pesquisa em Cultura Histórica e Documento	Universidade Federal do Estado do Rio de Janeiro
27. Física III-C – Física para engenharia	Universidade Federal do Rio Grande do Sul
28. Instrumentação Física	Universidade Federal do Rio Grande do Sul
29. Cálculo Numérico	Universidade Federal do Rio Grande do Sul
30. Aplicações da Matemática – A	Universidade Federal do Rio Grande do Sul
31. Introdução ao Cálculo Fracionário	Universidade Estadual Paulista
32. Sociedade de Consumo e Litígios em Massa	Universidade de São Paulo
33. Tradução Inglês – Português	Universidade Gama Filho
34. Planejamento Wikipédia na	Universidade com FGV SP Fundação Getulio Vargas (SP)
35. Introdução às Tecnologias da Comunicação	Universidade Federal Fluminense
36. WikiProjeto Medicina	WikiProjeto Medicina
37. Física IV Civil (FIS01223)	Universidade Federal do Rio Grande do Sul
38. Cálculo Numérico (MAT01169)	Universidade Federal do Rio Grande do Sul
39. Tradução do Alemão	Universidade Federal do Rio Grande do Sul
40. Introdução às Tecnologias da Comunicação	Universidade Federal Fluminense
41. Física III-C – Física para engenharia	Universidade Federal do Rio Grande do Sul
42. Instrumentação Física	Universidade Federal do Rio Grande do Sul
43. Física IV Civil (FIS01223)	Universidade Federal do Rio Grande do Sul

# Wikipedia in University Program: What Does the Meta-Analysis of the Courses' Page Tells Us?

44. Cálculo Numérico (MAT01169)	Universidade Federal do Rio Grande do Sul
45. O Mundo Helenístico	Universidade Federal do Estado do Rio de Janeiro
46. Introdução às Tecnologias da Comunicação	Universidade Federal Fluminense
47. Ciência Política	Faculdade Cásper Líbero
48. Matemática Aplicada II (MAT01168) (2014-2)	Universidade Federal do Rio Grande do Sul
49. Análise I (MAP0101)	Universidade Federal do Rio Grande do Sul
50. Cálculo Numérico (MAT01169)	Universidade Federal do Rio Grande do Sul
51. Termodinâmica e Mecânica Estatística (FIS01232)	Universidade Federal do Rio Grande do Sul
52. Gestão de Pessoas	Universidade Federal de Uberlândia
53. Liderança e Comportamento Organizacional	Universidade Federal de Uberlândia
54. Ciência Política	Faculdade Cásper Líbero
55. Sociologia	Faculdade Cásper Líbero
56. Gestão de Pessoas II	Universidade Federal de Uberlândia
57. Gestão de Pessoas I	Universidade Federal de Uberlândia
58. Criação de verbetes sobre História da Antiguidade Ocidental	Universidade Federal de Santa Catarina
59. Laboratório didático de Física e Práticas Pedagógicas VII	Universidade Federal do Rio Grande do Sul
60. Física III-C – Física para engenharia	Universidade Federal do Rio Grande do Sul
61. Comportamento Organizacional	Universidade Presbiteriana Mackenzie
62. Evolução: o sentido da vida	Universidade Estadual de Santa Cruz
63. Criação de verbetes sobre História da Antiguidade Ocidental	Universidade Federal de Santa Catarina
64. Laboratório didático de Física e Práticas Pedagógicas VII	Universidade Federal do Rio Grande do Sul
65. Instrumentação Física	Universidade Federal do Rio Grande do Sul
66. Física III-C – Física para engenharia	Universidade Federal do Rio Grande do Sul
67. Wikipédia na Universidade/Cursos/Contextos Educacionais	Universidade Aberta
68. Evolução: o sentido da vida	Universidade Estadual de Santa Cruz
69. Ecologia Geral	Universidade Estadual de Santa Cruz
70. Ciência Política	Faculdade Cásper Líbero
71. Biologia da Conservação	Universidade Estadual de Santa Cruz
72. Ecologia Geral	Universidade Estadual de Santa Cruz
73. Criação de verbetes sobre História da Antiguidade Ocidental	Universidade Federal de Santa Catarina
74. Laboratório didático de Física e Práticas Pedagógicas VII	Universidade Federal do Rio Grande do Sul
75. Introdução ao Cálculo Fracionário	Universidade Estadual Paulista
76. Ciência Política	Faculdade Cásper Líbero
77. Comportamento Humano nas Organizações	Universidade Presbiteriana Mackenzie
78. Gerenciamento Editorial em Mídias Digitais: Jornalismo de Dados	Pontifícia Universidade Católica de São Paulo
79. Caminhão com Ciência	Universidade Estadual de Santa Cruz
80. Tópicos Especiais em Ciência da Informação	Universidade Federal do Estado do Rio de Janeiro
81. Criação de verbetes sobre História da Antiguidade Ocidental	Universidade Federal de Santa Catarina
82. Laboratório didático de Física e Práticas Pedagógicas VII	Universidade Federal do Rio Grande do Sul
83. Gerenciamento Editorial em Mídias Digitais: Jornalismo de Dados	Pontifícia Universidade Católica de São Paulo
84. Gerenciamento Editorial em Mídias Digitais: Jornalismo de Dados	Pontifícia Universidade Católica de São Paulo
85. Extensão: Reformulação e construção de verbetes da Wikipédia na área de Teoria da História.	Universidade Federal de Santa Catarina
86. Extensão: Reformulação e construção de verbetes da Wikipédia na área de Teoria da História.	Universidade Federal de Santa Catarina
87. História Moderna II	Universidade Federal de São Paulo
88. Seminário de Pesquisa em História Antiga	Universidade Federal do Estado do Rio de Janeiro
89. Introdução à Biofotônica	Insper
90. Gerenciamento Editorial em Mídias Digitais: Jornalismo de Dados	Pontifícia Universidade Católica de São Paulo
91. Audiologia Educacional e Reabilitação Auditiva	Universidade de São Paulo
92. Editatona de Prevenção em Saúde	Universidade de São Paulo

## Analysis Instrument

Once the corpus of analysis was constituted, and based on both the objectives and the defined research questions, the methodology of analysis was designed, with the background of the identified methodology, which is presented below, duly completed with the identified Course as 67 in the corpus previously presented (Table 1). In its final version, it presents five macro categories that are segmented into subcategories (meso), and, in the case of the Referential and Methodology categories, they are further segmented into micro subcategories.

Table 2: Course Meta-Analysis Grid “Contextos Educacionais”

<b>1. Description</b>	
1.1. Course Designation:	<a href="#">Wikipédia na Universidade/Cursos/Contextos Educacionais</a>
1.2. Higher Education Institution:	Universidade Aberta
1.3. Year/ Semester:	2016/ 1st Semester
1.4. Country:	Portugal
<b>2. References</b>	
2.2. Curricular Area	
2.2.1. Exact Sciences:	—
2.2.2. Social and Human Sciences:	✓
<b>3. Methodologies</b>	
3.1. Actors (course participants)	
3.1.1. Teachers:	Teresa Cardoso (Teacher) and Filomena Pestana (Researcher)
3.1.2. Students:	4
3.1.3. Ambassadors:	Alchimista
3.2. Course availability format / typology	
3.2.1. Tipologia “A” (Edit-a-thon):	—
3.2.2. Tipologia “B” (Dashboard):	—
3.2.3. Tipologia “C” (Project Page):	—
3.2.4. Tipologia “D” (Project with 4 pages – Main, Discussion, Resources and Help):	✓
<b>4. Contributions</b>	
4.1. Level of access to information:	
4.1.1. Access Link Active:	✓
4.1.2. Access link not active:	—
<b>5. Implications</b>	
5.1. Articulation with other initiatives:	Not detected.

## Presentation and discussion of data

The analysis of the identified corpus tells us that in the period between 2010 and 2018 the page that aggregates the PWU courses from the Portuguese-speaking Wikipedia has a total of 92 courses, of which only 1 is from a Portuguese university, the remaining 91 come from educational institutions higher education (22 institutions). As can be seen in Table 1, the course took place in the first semester of 2016 with Universidade Aberta (Portugal) and is related to Social and Human Sciences, which in the corpus totals 51 occurrences with Exact Sciences 41 occurrences. With regard to the actors involved, this includes 1 professor, 1 researcher, 4 students and a Wikipedia ambassador. In total, the analysed corpus includes 42 professors, ~ 3,557 students and 62 ambassadors. Regarding the Format / Typology the course belongs to “D” (Project with 4 pages - Main, Discussion, Resources and Help). Format / typology “D” has the largest number of courses (33) with “A” having 5, “B” having 1 and “C” having 19 courses. We can see in Figure 3 the screen of the course page where the project page can be divided into 4 parts: Main, Discussion, Resources and Help. Another aspect that should be highlighted refers to the Level of access to information: which in the case of the course under analysis has its respective open link. The data collection was carried out in two stages: the first associated with the analysis and treatment

of the data collected from the page that is in the “Courses” tab of the PWU; the second stage was the result of the analysis and treatment of the page of each of the courses per se, which was, in some cases impossible, given that the link to the page of the respective course was inactive. As a result of these two phases, if on the one hand it was possible to list a wide range of evidence, on the other, we found, in some cases, little information. Thus, it was only possible to meta-analyse 57 as it was not possible to access 35 courses.

## **Conclusion**

Under the motto “Wikipedia belongs to education”, the Wikimedia Foundation created in 2010 the WEP and, in this, the WUP, in order to give higher quality to the content made available on Wikipedia, also involving the academic community in its construction. Having started in 2011 in Portuguese, it was important to map and meta-analyse the courses implemented since then. This problem is framed by an exploratory study, of a descriptive nature and meta-analytical nature, of mixed nature, integrating a quantitative and qualitative approach. In this field of action, MAECC®, Meta-model of Analysis and Exploration of Scientific Knowledge®, was adopted as an analytical-methodological instrument, supported simultaneously by document analysis and content analysis. Thus, the present article assumes itself as a part of a broader study and its main purpose is to identify, in the constituted corpus, what the meta-analysis of the only Portuguese university tells us? Thus, we conclude this highlighted point that in the context of 23 higher education institutions, a Portuguese one has implemented in the context of the 92 identified courses the course designated as “Educational Contexts”. Since the Portuguese institution has its pedagogical strategy defined, clear, and open promoting the PWU's own objectives and serving the transparency purposes defended by it. Like Knight and Pryke (2012), we also consider that Wikipedia, although controversial, assumes a role in education and therefore we continue to be instigated in order to contribute to the use of Wikipedia as OER.

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## REFLECTION ON HUMAN AND AUTOMATIC IMAGE DESCRIPTION IN ELEARNING CONTEXT

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### Abstract

Images have a strong presence in educational contexts, particularly in online environments. When images add vital information for the understanding of a given subject, this information must be perceived by all students, including those who have a visual impairment. Although most web tools and platforms have a field for the description or alternative text, most images do not contain this information. Since 2016, some platforms and web services have been providing features, based on Artificial Intelligence, which present a brief description of the images to screen readers. Are these descriptions effective for people with visual impairment, in an eLearning context? Are they enough for a blind person to create a mental image? How do they differ from the description performed by humans? To answer these questions, it is necessary to have an idea of how we perceive images and how they make sense in our brain, according to our values and culture. Thus, in this work we present a reflection related to these questions, using examples of descriptions obtained by the google chrome feature “Get image description” and descriptions made by people in the various editions of the MOOC “Image description in web context”.

**Keywords:** Inclusive eLearning, image description, automatic image description generation, web accessibility, visual impairment.

### Introduction

The text/image binomial has been widely investigated in areas such as communication, cognitive psychology, and education. Mayer and Anderson (1992) conducted a study with animation and narrative, having concluded that text and image are more effective when they occur simultaneously in space and time, just as words are more effective when spoken than when written. Robinson and Nagar (2010), Spindler, Klaus, and Weber, (2010), Jonassen, Carr, and Yueh (1998), Jonassen (1996), and Newby et al. (1996) consider that the integration of different elements, such as audio, text, and image, into educational resources makes learning more effective and responds more effectively to different student

profiles. Aware that the diversity of formats and channels increases the students' motivation and the learning effectiveness, it is important to bear in mind the different functions that images can assume in this context. Bodmer (1992) states that images in didactic resources or used in class as a pedagogical strategy (complementary to written text or oral explanation) serve to enlarge, explain, interpret or decorate a written text, performing specific functions different from other contexts, such as in a painting or photography exhibition. Rodriguez Dieguez (1977) also mentions that one of the main tasks of didactics is the selection of communication codes, explaining that most materials use verbal codes. According to the author, different codes must be combined in pedagogy, namely the iconic code properly combined with the verbal code. Carney and Levin (2002), consider that images assume 5 functions when they are used simultaneously with the text:

- decorative function, when only decorates the text, that is, assumes a role of embellishment, may or may not be related to the text;
- representative function, when representing a part or all of the textual content;
- organizing function, when presented in a charismatic way an idea or a structure, a route;
- interpretive function, when it helps to clarify more complex text;
- transformative function, when reinforcing the memorization of textual information.

These authors also refer to a study conducted by Levin et al. 1987, where the benefits of the different image functions (in textual content) were analysed. They concluded that images with decorative function did not bring any benefit, unlike the images with the other 4 functions, namely the transformative function that presented greater benefits in learning.

Considering that blind people and some people with low vision do not have visual access to images, a textual equivalent should be given, particularly in eLearning context. This text must provide information about the elements contained in the image. If this textual equivalent does not exist or is poorly elaborated, the person who does not have visual access to the image may be at a disadvantage compared to those who have visual access to the whole content. Although accessibility guidelines for web content (WCAG) explain how to fill image/figure HTML attributes, the way it is described and what is written always depends on the visual literacy and interpretation of the *descriptor* (who describes it). This means that the same image can have numerous descriptions and may give too much information or not give enough and/or useful information. According to some studies (Francisco, 2008; 2015; Petrie, Harrison, & Dev, 2005) and blind people statements regarding their preferences (Kleege, 2008; Edison, 2012; NVDA discussion group and WAI discussion group), the image description must comply with certain parameters and be as objective as possible. Francisco (2015) conducted a study involving blind/low vision and

sighted people to verify the efficacy of the parameterized description. This study validated a matrix of parameters that helps the “descriptor” to create long descriptions and should be applied only to images considered vital in an educational resource. At this point, we may ask whether the automatic description generation is appropriate and whether it can replace the description performed by humans. When we refer to automatic description generation, we are considering the process referred by Brownlee (2019):

*“Automatic image captioning is the task where, given a photograph, the system must generate a caption that describes the contents of the image”.*

When we refer to the manual or human description we are considering the text that people write in HTML attributes whenever they insert an image into a digital content or webpage). Most of the time, these texts are only available to screen readers.

## **Image perception**

According to Berger (1972), the act of seeing involves not only the optical function but also a set of information that allows us to identify what is seen. DeWitt (2013) explains that the constitution of the eye allows to perform the optical and perceptual functions, that is, the optical function captures the images focused by the retina and the perceptual function processes the luminous stimuli, transmitting them to the brain in a coded way. Optic nerve fibres have the function of transporting the information perceived by the retina to the brain. This means that to recreate a perceptive image a complex combination between the eyes and the brain is necessary. In psychological terms, this process is known as visual perception, however, and according to Collignon et al. (2011), Kupers et al. (2010; 2011), Bedny et al. (2009; 2011) and Burton, Diamond, and McDermott (2003), the absence of this process (e.g. blindness) doesn't mean that some visual functions, such as the pupillary reflex or the visual cortex activation, are not used. The authors also report that in the absence of a sense or function, namely vision, there is a relocation due to the plasticity of the brain. Sacks (2010) adds that this plasticity can provide a blind person with a “hyperacuity” that will be far beyond the visual capacity of a person with vision, being possible to create mental images or visual representations through other sensory stimuli. However, individuals may not be “aware” of brain-activated functions, as reported by Damásio (2000; 2010).

Based on the assumption that the brain creates mental representations from the various stimulus, we can question whether the text can trigger the process of creating mental images. Humphreys et al. (2013) consider that language is often used to describe real-world situations, as such, words and phrases evoke mental representations of objects and experiences perceived by the senses. However, the authors report that this perspective is not consensual among researchers, considering that there are 3 different lines of thought

regarding semantic representations and descriptions of actions related to movement: (a) there is an organization around linguistics and the representation of action concepts (movement) and that is distributed along the sensory cortexes, but this doesn't mean that linguistic representations are identical to the perceptions; (b) there is a neuronal connection between words and experiences related to these words, that is, words related to actions are learned in the context of the execution or observation of these actions; (c) representations are independent of the perception.

Despite the different perspectives, it seems evident that there is a strong relationship between the word and the imagery of the real world, whether it is perceived by vision or another sense, even if this relationship is not consciously presented to individuals.

### **Empirical study: Automatic description versus Human description**

Since 2010 we have been conducting studies on image description, in workshops and MOOC. Participants are asked to select an image from the web and describe it. When no indications are provided about how and what to describe an image, most people create a brief description. The description is usually presented in a single sentence, consisting of 4 to 10 words.

In 2016, Facebook announced the incorporation of artificial intelligence that allowed to describe images to blind users. (Wu, Wieland, Farivar, Omid, & Schiller, 2017). On the Facebook website, they explain how does it work:

*“Automatic alternative (alt) text uses object recognition technology to create a description of a photo for the blind and vision-loss community.”*

This alternative text was formed by isolated words, as pointed out by Mazzoni (2019), Brownlee (2019), Karpathy (2016):

*“The descriptions generated by artificial intelligence are based on labels that fall on the objects with greater prominence in the images.”*

Since then, we have been testing, with screen reader users, different types of photos shared on this social network. In 2019 Google announced the new accessibility feature to describe images, and they explain on their support website how does it works:

*“When you use a screen reader in Chrome, you can get descriptions of unlabelled images, for example, images that don't have alt text. Images are sent to Google to create the descriptions. If Google cannot describe an image, the screen reader will say ‘No description available’.”*

Although we are still testing this feature, we consider it appropriate to make a comparative analysis between the type of information presented in the descriptions, we already analysed:

- 100 descriptions made by people in the activity proposed in the open online courses “Describing images in a digital context” (2018/2019) and “Web accessibility: where to start” (2019/20120) (<https://www.nau.edu.pt/cursos/>);
- 30 descriptions obtained by Google Chrome feature “Get Image Descriptions”, about images available in different Open Educational Resources (<https://www.casadasciencias.org>), using NVDA screen reader.

Table 1: Type of information presented in human descriptions and descriptions

Elements	Human description	Google automatic description
Sentence Beginnings	Photography of ... Image of ... In this image we see ...	Appears to be ...
Use of Adjectives	Yes	No
Colours	Yes	No
Environment	Sometimes	Sometimes
Main Objects/figures	Yes	Yes
Hidden information	Yes (e.g. Cities, dates, names)	No
Spatial references	No	No

In addition to these elements, it was found that some descriptions made by people (without previous indications of how to describe) repeat the title of the news or page where the image is inserted. The automatically generated descriptions refer to the objects highlighted in the image, only if there is a high contrast between the objects and the background.

## Final considerations

Virtual environments can contain decorative or motivational images for those who can see, also educational content can use reinforcement images to a written subject. In these cases, it will make no sense to use long and complex descriptions. Only concise and succinct texts should be used to allow people to create a general idea of what is represented in the image. From the brief analysis carried out in our study, we can consider that the automatic description obtained with Google Chrome feature may have advantages over descriptions made by people who are not aware of how to write an image description. Artificial intelligence only interprets and associates the contrasts of spots, while people, as mentioned in the Image perception section, interpret what they see according to their experience and values.

However, we’ve found out that Google’s feature doesn’t display descriptions of images available on LMS platforms. Many web platforms, in the most current versions, force the user to write a description whenever uploading an image or to alternatively mark it as

decorative. In the latter case, screen readers do not detect the image, so they do not receive the description from google. We also found that artificial intelligence currently used does not interpret images based on schemes, drawings, complex or detailed photographs. In images with diagrams that display text, only the text is read, so, the context is lost. We consider that this study should be deepened since automatic descriptions are increasingly well structured and can be a good tool for creating alternative text in the eLearning context.

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## **ON THE PARADOXES OF TEACHING DIGITAL ANTHROPOLOGY ONLINE: REFLEXIVE PEDAGOGY AND THE CHALLENGES OF INVOLUNTARY ONLINE LEARNING**

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### **Abstract**

The paper examines the heightened role of reflexive pedagogy and the challenges of participation that came as a result of the sudden transition of conventional higher education into an exclusively online modality during the 2020 covid-19 pandemic. Drawing on the cultural and educational context of Greece, the paper focuses on the case study of an undergraduate course in Digital Anthropology at Panteion University and details the challenges that were met creatively by the students and the instructor. To that end it employs an ethnographic study of the classroom, and discusses students' testimonies from the weekly online evaluation that was performed during the spring term 2020 along several axes of participation which include: participation in numbers; participation in active dialogue; participation in (collaborative) coursework using multimedia format; participation in ongoing evaluation; silent and invisible participation. The analysis is contextualized in the unprecedented social and educational conditions of the pandemic and its repercussions on the shifting roles and performances of students and instructors.

**Keywords:** reflexive pedagogy, student participation, online evaluation, digital anthropology

### **Introducing problematics and methods in an unprecedented context**

This paper details the sudden shift that occurred in the class dynamic when, in March 2020, we had to transfer all academic activity online due to the covid-19 pandemic. At the beginning of term, after one introductory face to face meeting with students of the Digital Anthropology undergraduate course at the Anthropology Department of Panteion University (Athens, Greece), the measures that the Greek government deemed necessary for the prevention of the virus outbreak forced all universities to hold lectures, meetings and administrative procedures through instant messaging and videoconferencing software (such as Skype for Business, Teams, Zoom etc.)

This sudden shift brought about a series of noticeable obstacles on the part of instructors who lacked previous experience with distance learning modalities: the lack of training and familiarity of academic staff with digital technologies; the reaction to top-down political decisions that gravely affected the day-to-day practices and the long term shifts which derived from the transfer of educational activity into online environments; the fear that this situation would signal permanent changes that would heighten professional precarity in the academia in a neoliberal logic. On the other hand, the students expressed similar anxieties: unequal access to digital technologies or inadequate training was reported to be a very intimidating factor, at least at first, along with the fear that precious immediate contact with peers and teachers would diminish the quality of studies and that ultimately the academic term would be lost. Such concerns lasted throughout the term (which was held and evaluated entirely online), but on the present paper I will be focusing on what seemed to me to be a 'positive' side of this social and educational turmoil. The questions raised regard the heightened role of reflexive pedagogy in the digital environment as well as the different forms of participation enabled by this unique contingency, mainly based on reflexivity, experimentation and collaborative learning.

Methodologically, I followed a standard practice in the anthropology of education, placing myself at the position of the instructor and team coordinator and at the same time performing online participant observation, journal keeping and collecting digital traces from the weekly lectures/meetings with students. The latter consist in images, feedback forms, chat discussions in the Skype for Business environment, blog posts etc. The observation lasted three months (early March to early June), and the research questions were admittedly formed along the way. At the end of term, I analysed the collected data on the axis of student participation and reflexive learning. The student population of the class varied from 117 to 38 participants (312 being officially registered in the class), with a rough gender ratio (male/female) of one to four, aged 20 to 25 with a few older students, ranging from 30 to 50 years of age. With the exception of two students, all were Greek native speakers. Unfortunately, the collected data cannot account for the persons who never attended the online meetings, and/or participated in the chats, the evaluation forms, the presentations or the collaborative activities and exercises performed throughout the term. The overall evaluation was very good, ranging from 4 to 5 points (in standard 5-point Likert scale) for the top 75% of the class participants. The strategies that I employed in order to cope with the situation was to try and create a supportive, non-judgemental and less formal learning environment, to encourage participation through paper presentations, short research exercises and multimodal communication and to utilize students' experiences in order to make use of their situated, authentic and constructive learning capacities. Given all of the above, it needs to be noted that, ironically, the specific course coincided perfectly

with the forced online contingency. As a student observed: “I was really intrigued by your research in digital ethnography and this lesson gives us the opportunity to imagine the empathy between the subjects under study”.

## **The various facets of participation**

### ***Participation in numbers***

As a rough first indicator of student participation, the course had a steady audience of around 60 persons with certain ups and downs depending on the point in time (beginning/end of term etc.) and other time-related factors. Apart from lectures, presentations, discussion and other activities, at the end of every meeting participants were given a link and were asked to fill in an online form with two questions (How was your overall impression from today’s meeting? Would you like to contribute any other comments?) which, as I explained, would help me keep communication channels open and identify areas of interest that could be improved, fine-tuned or incorporated in the course. Even though I asked students to give a numeric (Likert scale) representation of their overall impression of each class meeting, this was taken as a mild indication and was not treated statistically but only as a supplementary tool for guiding the preparation of the next class or coursework.

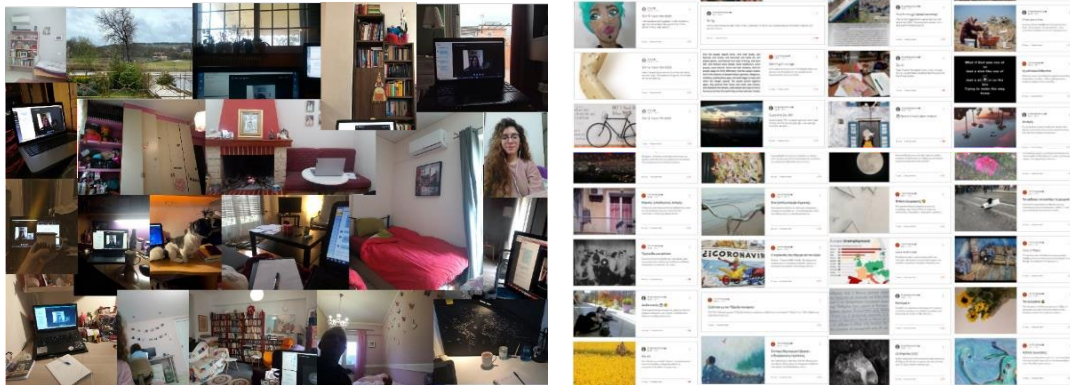
Table 1: Numeric representation of student participation in synchronous online instruction throughout term

Course week	Participants in class	Participants in evaluation	Participation %
Week 3 (Initial feedback and preferences form)	312 registered (c.50 attended)	81	26
Week 4 (Lecture/meeting & evaluation)	98	32	33
Week 5 (Lecture/meeting & evaluation)	117	31	26
Week 6 (Informal online meeting)	38	-	-
Week 7 (Lecture/meeting & evaluation)	56	26	46
Week 8 (Lecture/meeting & evaluation)	61	13	21
Week 9 (Lecture/meeting & evaluation)	49	12	25
Week 10 (Final meeting & extended evaluation)	101	38	38

As indicated in the above table the participation in the online evaluation was impressively stable and accounted for almost one fourth of the student population, which, compared to past observations, was indeed facilitated by the digital component of instantly sharing the link and filling in the form right after the closing remarks of the meeting. Also, and perhaps more importantly, students were able to express opinions in short written form and anonymously, being at the same time informed that one’s opinion is important and formative of the course they partake in.

### ***Dialogic and collaborative participation***

Another important observation is that the multimedia format of the class acted as a liberating factor, unleashing the critical and creative potential of many students who, according to their account, would never dare create a PowerPoint or video presentation for an undergraduate course or contribute jokes and casual anecdotes in a padlet and had rarely before worked together with classmates in order to build something (a digital artefact, a blog, a podcast etc.). This potential was expressed in-class with vivid verbal and written dialogue among the students (even though some were consistently more talkative than others) but it was also noted in the mid and final evaluation forms. This collaborative strand was also visually and multimodally encouraged, as one of the first thing I asked in our first impromptu online meeting was to share a photo of their surroundings in order to co-create the class environment and share it among ourselves. Another component that was highly appreciated was the inclusion of two or three 15-minute presentations of articles, videos and digital artefacts that was performed in a collective and reflexive manner. As students testified: “It made the class less monotonous”, “Our classmates’ presentations were finely prepared and very interesting- thank you!” “The constant dialogue that existed between the teacher and the students and the fact that our own voice could be heard, about things that were related to the lesson and on a more practical level.”



Figures 1, 2. Our classroom digital collage meeting & Selected samples from the collective course blog (<https://annapostolidou.wixsite.com/viralanthro/blog>)

The interaction and the multisensory stimulus was another parameter that was positively commended upon (“It made me feel alive in the context of extreme hardship that we are going through!” Your class and everything we see and learn through it, as well as the energy and liveliness that we see reproduced on our screen is the reason that I give up my sleep –which I love- every Friday”) whereas some students found it more difficult to keep up with the flow of information (“Too much information”, “I couldn’t keep notes as usual”, “The conditions under which the class is taught makes it difficult for me”, “I wish we had

less visual stimuli and got deeper on some of the issues raised”). As a student summarized it: “Many courses these days are to some extent an extra burden that we all have to bear – students and teachers. There is a perplexity in how to share knowledge, an injustice in who speaks and who does not, and, in general, the desired result cannot be achieved everywhere. These days when so many things are different – and for many in more unpleasant ways than others – lessons turn into obligations that we must meet, while at the same time finding it difficult to fulfil many other, and perhaps more basic, aspects of our lives. But with this lesson it is not so. It’s like a Skype ‘with friends’, and the teacher’s figure is just the figure of that friendly person who wants to share a new, exciting knowledge and information with us, and to do so in such a dialectical way, that it impresses. It is difficult to feel intimate and to be with trusted people in a dark background that frighteningly illuminates the ‘96 participants’, but in this lesson we succeed, and I look forward to the next lecture each time... (Sorry I wrote so much, but anonymity opens up the possibility of things being said outside the ‘wooden’ [formal] writing of emails, and gives me the opportunity to express my thoughts honestly).”

### ***Hesitant, subtle and silent participation***

This mode of participation was achieved in two distinctive ways. The first one was my proposition that those who wished to participate in the class chat but were reluctant to do so with their name and surname visible to other participants might at any time disconnect and reconnect to the teleconferencing with a pseudonym. This was a defining factor that helped a small albeit important percentage of the students to offer comments, links, ideas and criticism without being identified by their names or showing their face on camera. This was indeed an extremely encouraging finding, one that in my view is worth pursuing further in our educational practices, following an anthropological tradition of ‘protecting’ our interlocutors’ identities and sense of integrity. The second way of students contributing to the classwork and ongoing discussion was the creation of the course blog, which I set up during the first days of the lockdown and swiftly after handed over to a student who expressed an interest in acting as an administrator for the duration of the term. Even though timid at first, the participation of anonymous and eponymous posts from class members exceeded my initial expectations and resulted in a polyphonic, heterogeneous and intriguing weblog that stretched thematically from the quarantine to the coursework and beyond.

Another initiative worth mentioning is that we arranged to meet for an online afternoon tea, which brought us much closer. Even though only 38 persons participated (it was not a course prerequisite and it was held during Eastern Holidays), the interaction was much less informal, much more inquisitive and helped us ‘rehearse’ many of the ideas we

touched upon in the overall discussion, like techno-sociality, social presence and collaborative work. The impressive finding from this meeting is that only 9 out of 38 persons opened their mics and cameras to contribute to the informal discussion, the majority of those who entered the meeting stayed throughout the 3 hours and maintained a silent and stable “presence”, which was noticeable by all of the class members who shared their thoughts. On this particular occasion I forgot to provide an evaluation link in the last minutes of our meeting and posted it afterwards on the LMS platform, where no one filled it in. The discussion and dialogue encouraged by myself and some of the more talkative students assisted others to participate, if silently, to the overall communication and team building (“The class had great interaction and this makes it different”, “Great vibe, great ideas-thanks!”, “I loved the fact that we could pose questions and have short discussions through the chat without interrupting you or our classmates who were giving presentations”, “Nice atmosphere, loved the interaction provided through the comments”). Finally, there were those who partook in all class activity, but did so in their own terms: “I personally decided not to answer the questionnaire, as I think it would distort the results a bit. The questionnaire worries me because it is very similar to what we would complete in class, under normal conditions. To make it more understandable, I do not think that the course as you planned it had a problem, however, the online course deprived me of what life offers.”

### **Reflexive pedagogy in a digital context**

The aforementioned ways of participation brought about another crucial question on the instructional design of this peculiar term, which required a limited theoretical consideration. Drawing from my background in constructivist, situated and transformative pedagogical paradigms I decided to turn my focus exclusively on the concept of reflexivity and try to cultivate reflexive and self-reflexive thought, as an integral part of anthropological inquiry, and teaching. Ryan (2014) discusses the different personal epistemologies of teachers and students, which are central not only to the process of individual learning, but also to the transformation and re-making of culture; as such, they impact ways of knowing and acting, negotiation of previous experiences, capacity building and interaction with the social and sensory world, to shape how one learns. Drawing on Archer’s body of work, she identifies various reflexive modalities (e.g. absolutist, subjectivist, evaluativist) that guide autonomous or communicative reflexivity and are intrinsic to meaningful learning. While it is rather utopian to support that one can effectively identify and sort out these learning epistemologies in large and unstable groups of students, these acted as guiding typologies that helped shaped the various different ways I attempted to encourage reflexive learning in class. Reflection has been variously defined from different perspectives (e.g. critical theory or professional practice) and disciplines (see

Boud 1999), broadly covering two key elements: (a) making sense of experience; and importantly, (b) reimagining future experience. This definition reflects the belief that reflection can operate at a number of levels, and suggests that to achieve the second element (reimagining), one must reach the higher, more abstract levels of critical reflection. Ryan (2014; pp.14-15) refers to this type of reflection as academic or professional reflection, which involves learners making sense of their experiences in a range of ways by: understanding the context of learning and the particular issues that may arise; understanding their own contribution to that context, including past experiences, values/philosophies and knowledge; drawing on other evidence or explanation from the literature or relevant theories to explain why these experiences have played out or what could be different; and using all of this knowledge to re-imagine and ultimately improve future experience and social structures. This is exactly what we attempted to achieve, by treating everyday news, experiences, course material, interactions, and obstacles as opportunities for personal and collective contemplation and leaving the curriculum to work in the background.

It soon became apparent that contemporary learners value increased reflexivity that attends to contoured experiences and multimodal meaning-making. Our “pedagogical orientations” (Abrams, 2015; p.37), which represent the relationship among socio-culturally situated understandings and discoveries and the (re)creation and/or transformation of meaning and artifacts, helped to shed light on the needs of current and future physical and digital citizenship. We employed various approaches such as learning by design (Arvanitis, 2018), learning through artefact reflection (Ryan, 2014) and employing authentic learning. Paramount to this approach is that the teacher learns to function as a member of a collegiality, developing a collective intelligence and engage in knowledge processes such as experiencing, theorizing, analysing and implementing (Kalantzis & Cope, 2012). In this effort, we often used visual stimuli as critical visual inquiry, in the logic that spectacle strategies in learning entail great engagement, echoing Merleau-Ponty’s experiential position, and allowing for learning moments to become transformative possibilities through physical, emotional, and intellectual triggers. As offered in the evaluation: “The presentations, the non-strict style of the lesson, the continuous feedback, the blog, the visual ‘teasers’ of the lesson, the constant dialogue that existed between the teacher and the students. I also saw a different perspective on the digital world and became acquainted with digital anthropology, which I initially did not particularly like as I had a distorted knowledge of its subject matter.”

Indeed, the main principle of the E-Learning 2.0, or digital turn in higher education signals the digital shift from teaching to Learning, termed “Digitalization of Teaching and Learning”, which requires to invent a technical infrastructure as well as didactical

counselling for teachers and learners, so that digital-based learning can be realized (Kergel et al., 2018). In this context, open approaches to digital literacy are conceptualized and practically encouraged in higher education, especially based on sociocultural models of digital literacy and practice (Gruszczynska et al., 2013). In-class participant observation becomes here a great opportunity to address teachers' and learners' preconceptions and ways of knowing, apprehending and learning as well as sharpening our/their "reflexive reflexes" as future anthropologists. In a sense, the pandemic gave many students the chance to rehearse artful or collaborative auto-ethnography, termed by some "digital reflection" or "digital bricolage" in the sense of using digital media to bring together the learning and imaginative capacities of students who creatively employ arts-based methodologies to learn, interact and perform in a con-conventional academic environment. In this case, as testified, this created multiple channels of communication: "It was so far the only lesson in which we have done so many small but creative activities that really filled me with thoughts and reflections. A lesson that I will remember both because of the experience of incarceration and the special atmosphere of the lesson itself. Open, accessible, natural and friendly."

However, as Iszatt-White et al. (2017) point out, the desire to engage students in reflexive learning interventions and to disrupt the power asymmetries and hierarchical dependencies of more traditional educator-student relationships often results in highlighting those very asymmetries and dependencies. Successful resolution of such a paradox depends on the ability of educators to undo their own reliance on authority underpinned by a sense of theory-based expertise. This concept of "distributed teaching responsibility" (Guri-Rosenblit, 2011) was a useful guiding line for my own practice and it seemed to have a relaxing and bonding effect in the course team, made evident by various oral and written comments offered by students. Indeed, as Arvanities notes (2018; p.116) transformative education rethinks agency as the "relations between expert knowledge sources (teachers and authoritative texts) and novices (learners) are reconfigured" (Kalantzis & Cope, 2012; p.273) and reflexivity is perceived on the basis of reciprocity, and more often than not the reversal of roles, e.g. teachers as learners and learners as teachers (Arbams, 2015; p.38). This process requires an 'identity undoing' in the part of educators, which is found to have strong connections to the impact on identity of power relations, resistance and struggle.

Novel approaches such as feminist data studies (Leurs, 2017) call for a reflexive and power-sensitive data scholarship that does not misrecognise the gender, race, geography and crypto-colonial skews in big data and quickly digitalization of the university. In that respect, the evaluation indicated that students greatly appreciated a professor for her social presence online (for "being there", giving positive energy), for valuing their viewpoint



(feedback forms being one way that this was demonstrated), and for establishing a supportive and open overall atmosphere, with constant and easy-going communication. Apart from the flow of information and the risk of sharing and showing too much on each class, the pace of the discussion was also dictated by many comments I received (“Please when you pose a question allow for more time so that those of us who are less courageous and may need a bit more time to overcome the mic/camera/stage fright and participate”).

However, this is not an uncomplicated task for educators worldwide. According to Schlusmans et al. (2004) the organizational approaches of a classroom-based teaching are closely aligned with artisan or craftsman practices where the academics are responsible for the entire development and delivery process of their courses. In comprehensive online teaching frameworks, as well as in large-scale distance teaching universities, the academics are required either to assume new roles or to collaborate in a team framework with tutors, editors, instructional designers, television producers, computer experts, graphic production personnel, etc. in developing and delivering their courses (Guri-Rosenblit, 2011; p.21). It is notable that professors who view the academic freedom in teaching as a sacred value of their profession, resist strongly the unbundling of their teaching responsibility and the participation in a team framework (Guri-Rosenblit, 2011; p.22), which is further enhanced by lack of support infrastructures and often adequate technological literacy.

Returning to the empirical discussion, in the case study under scope, two more questions from the evaluation stand out in terms of the students’ account of their reflexive cultivation. In the first “To what extent did this course help you to experience your position in the training team differently?” Out of the 37 responses, 22 rated it 3 (not really), 51 rated it 4 (considerably) and another 22 rated it 5 (very much). In the question “To what extent did this course help you change the way you think about some issues related to anthropology?” the responses were quite similar: 23 answered 3 (not really), 51 answered 4 (considerably) and 23 rated 5 (very much). For me this was a strong indicator that the novel character of the course’s approach acted at a deep reflexive level and created the conditions for much-needed experimentation and introspection during a troubled period of time. Moreover, as other studies illustrate, including feedback from students provides evidence that diversification of communication within teaching and learning practice gives students more choice and opportunity to interact with both their peers and teaching staff (Young & Nichols, 2017). As a student astutely noted: “[What I valued the most was] a tendency to do things that never happened before”.

## **Implications for “real lessons” online**

Ryan (2013) argues for a reflexive pedagogical balancing act of attending to different levels of reflection (i.e. Reporting and responding, Relating, Reasoning, and Reconstructing) as a way to stimulate focused, thoughtful and reasoned reflections that show evidence of new ways of thinking and doing. He notes that, while the goal of academic or professional reflection is generally to move students to the highest level of reflection to transform their learning/practice, unless higher education teachers attend to every level of reflection there are specific, observable gaps in the reflections that students produce. Balancing my efforts and attending to all four levels was the centre of my focus throughout the term; additionally, the final evaluation of the Digital Anthropology course included questions that addressed all four levels, however difficult to measure, numerically or otherwise.

The implications of this example indicate that sometimes sudden changes in the parameters of learning may have a positive effect in the process. In fact, leaps may be observed in the sensibilities that co-construct learning in the university when a major factor, such as face to face contact, is no longer an option. Designing open, reflexive, task-oriented and collaborative pedagogy in higher education, engulfing accessible digital practices when possible is a complicated task which needs to be backed by scaffolding activities and consistent supportive initiatives. Indeed, the issue of student support for reflexive and emotional interactions was proven to be paramount, as is the case in other sociocultural pedagogical contexts (Augustsson, 2010). This type of purposeful reflection, which is generally the aim in higher education courses must ultimately reach the critical level for deep, active learning to occur. Such reflection is underpinned by a transformative approach to learning that sees the pedagogical process as one of Mezirowian knowledge transformation and emancipation rather than knowledge transmission (Ryan, 2014; p.18). As a young student remarked in response to the question “What will stay with you most from this term’s overall experience?”: “These meetings, which included discussions from our experience and daily life, and a more general dialogue, were more essential than a simple lesson. They changed the ways we think about ourselves and anthropology, and they were not just presentations, but a real lesson!”

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## LEARNING ENGINEERING AND REENGINEERING FOR ONLINE AND HYBRID ENVIRONMENTS: A CASE STUDY OF A BLENDED COURSE

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### Abstract

The transformative actions in education, driven by the social changes in our contemporary society, aim to adapt individuals to the new socio-economic environment. As a result, the digitalisation of adult education takes on a significant role, in response to the need for constant and less time-consuming training. How does the use of new technologies in adult education contribute to the reconfiguration of learning engineering?

The aim of this article is to examine the current transformations in education, better understand the recent developments induced by blended learning and the effects observed in adults. To do so, we conducted a case study on adult learners during the academic years 2018-2020. The experimentation consisted in transforming a face-to-face course into a blended course. The presentation and analysis of the engineering of the blended learning scenario attempts to answer the following question: How does blended learning transform the practices of accompaniment, support or coaching (Papadopoulou, 2020)? As for the analysis of the three questionnaires proposed to the students, it aims to answer the question: How does the introduction of blended courses effect the adult learners? Thus, cross-analysis of the collected data provides results about the transformations of practices caused by the integration of new technologies in adult education.

**Keywords:** Open and Distance Learning (ODL), Learning engineering, Blended learning, Learning scenario, Accompaniment

### Introduction and research objective

Distance and blended learning were introduced in adult education under the impetus of socioeconomic changes. This context refers to an acceleration (Rosa, 2014) of the rhythms that lead to the application of existing teaching methods (those used in face-to-face

training) in online environments and practices. However, researches (Papadopoulou, 2020) have shown the importance of adapting our practices to the new digital and socio-educational environments.

Indeed, new technologies in training will always meet limits (Linard, 2001). By their nature, they encourage us to do rather than think, or even more to repeat than invent. On the contrary, adult education “consists less on doing than reflecting and less on navigating online than building paths in the real world” (p.236). Therefore, the tensions are still to be resolved. Trying to resolve these tensions requires questioning the learning engineering and in particular, the accompanying engineering used during a blended or distance training. What should we change in learning engineering in order to adapt our practices to the particularities of distance learning?

To try to answer this question, we have set up an experiment based on the transformation of a Master degree face-to-face course, into a blended course. Our research work consisted both of analysing the engineering used for the design and animation of the experimental blended scenario, and at the same time of observing, collecting and analysing the uses and effects of this pedagogical transformation on learners.

### **Transforming Portfolio into a blended course: the context of the case study**

The experiment is based on the course “Narrative approaches and accompaniment of the experiences: the reflexive portfolio”. The duration of the course is thirty-three hours, spread over four and a half days during the first semester. It consists of four phases (Breton, 2015):

54. The presentation of the approach, the formalization of the framework and the biographical feedback on the life path and/or the professional path (first session);
55. The accompaniment to the configuration of the experience in three stages: identification and explanation of significant moments and categorisation of experiences (second session);
56. Structuring of portfolio support and choice of dissemination methods (third session);
57. Presentation of portfolio approaches (fourth session).

The case study involved a group of 23 students over three years. In 2018-2019, we implemented the transformation of the course Portfolio into a blended training. A first group took advantage of the online environment, created for this purpose. However, it was only in 2019-2020 that students were able to take the blended training and produce a

reflective feedback as their experiences unfolded. The third year 2020-2021 is dedicated to the analysis of the collected data and the communication of the results. This article is part of a first communication at this stage of analysis.

The students, who are part of the experiment, are 35 to 40 years old and have several years of professional experience in various sectors. They usually undertake studies aiming a professional development or retraining. We are therefore clearly dealing with adults for whom the modalities of university education and, even more so, those of online education do not represent the usual conditions of learning. Of the two teacher-researchers who participated in the experiment, only one is qualified in distance learning practices.

## **Transformation of the training through the integration of new technologies**

As a reminder, the objective of our study is to measure the transformations in engineering induced by the introduction of distance learning in the course Portfolio. In order to do so, we analysed the learning scenario implemented and the effects produced on the learners. Following the presentation of the context of our study, we propose here to clarify the notions of *learning scenario* and *accompanying engineering* before presenting the methodology and results of our study.

### ***Introduction of learning scenarios in adults' training***

The term of *scenario* remains hard to define, as it is sometimes linked to a lesson plan, a learning method or a teaching strategy (Dessus, 2006). For our research, by scenario, we refer to the use of an IT platform for coaching activities, learning activities (consultation of resources, remote practical work, etc.) and methods of activity organization (work phases involving presence and distance, individual and group work, forms of evaluation, etc.). We build on the “collaborative case study scenario” approach proposed by Godinet (2007), while adapting it to our context. The particularity of this scenario is “that it places a clear emphasis on the production of knowledge and skills by the learners themselves (“learning” model), rather than on the restitution of knowledge carried out under the control of the teacher” (Eneau & Simonian, 2011; p.101).

### ***An accompanying engineering to reinvent***

If our objective is to understand how the integration of new technologies in adult education transforms accompanying practices and learning engineering, we must first clarify these concepts. To do so, we draw on our previous researches in the field of distance learning, which led us to define an ingenious approach of Open and *Integrative* Distance Learning (OIDL) (Papadopoulou, 2020; forthcoming). The concept of *integrative distance* refers to a

*“Conducive environment to raise awareness of the experiences of the learner, in order to transform them into communicable skills and knowledge but also to give meaning to his personal, professional, training, even existential process. It articulates didactic of the contents and accompaniment of the learners’ experiences” (Papadopoulou, 2020; p.304).*

In other words, to transform ODL into an Open and Integrative Distance Learning (OIDL) we need to articulate the teaching of the contents and the accompaniment of learners. The accompanying engineering in an OIDL, proposed in this framework, includes four levels:

- 58. Institutional level – It constitutes the broadest framework. Its objective is the co-responsibility of the actors.
- 59. Organizational level – It corresponds to the learning engineering based on the experiential continuity of the learners.
- 60. Operational level – It corresponds to the accompanying engineering. It aims the accompaniment of the experiences of the learners.
- 61. Technological level – It invites the learner to reflect on the appropriation of the online environment through the accompaniment on the use of the tools.

### **A case study for the analysis of a complex phenomenon**

What changes in engineering would lead to a better accompaniment of adults in blended training? To answer this research question, we used a qualitative case study approach combining:

- 62. ethnographic observations, in particular on the implementation and animation of the courses;
- 63. analysis of the learning engineering of the scenario;
- 64. analysis of the questionnaires answered by the learners.

The case study seems suitable for an analysis of the transformations made to the learning scenario in terms of engineering and the feedback of the students on their uses and intentions, because it allows studying a specific phenomenon in the complex context of distance learning (Yin, 1984). Immersion in the field and active listening allowed a more in-depth analysis of the students’ responses to the questionnaires and highlighted sensitive and intimate points.

## Methods of data collection: between experimentation and questionnaires

The Figure 1 presents the flowchart of the temporality and organization of the different steps of the study.

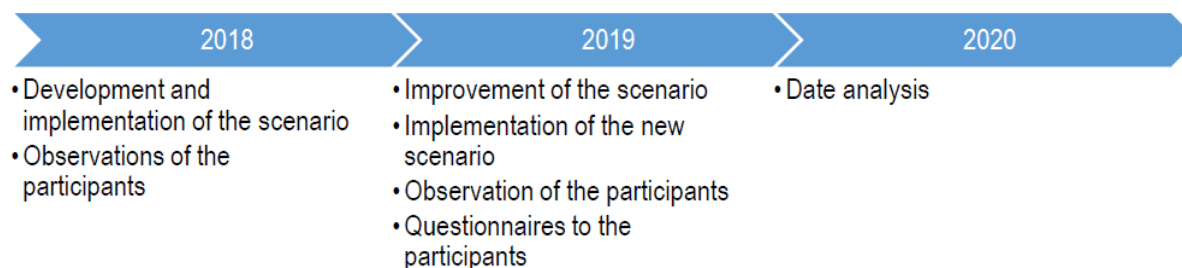


Figure 1. Phasing of the field work

We started with the transformation of the face-to-face Portfolio course into a blended course. To do so, we shot and edited six videos of a duration of five to ten minutes. In addition to these videos, we created a forum allowing distance support through the free expression of students and exchanges with trainers. Finally, other educational resources have been put on the platform, such as textual resources, to complete the theoretical contributions, to answer the questions of the students, to go further on the approach for those who wish it, and to customize the training in order to meet individual needs.

We made the hypothesis that these resources facilitate the process of creating a portfolio, by allowing a reflective feedback on the approach and a projection on the future use of the portfolio by students in the context of their professional and personal activities. A second hypothesis was that blended training would favour the experiential continuum (Dewey, 2006) of the students by articulating the theoretical contributions with the reflective work on their experiences by a hetero-accompaniment in face-to-face learning and a self-accompaniment during distance learning.

Finally, we proposed to students three questionnaires, one for each intersession. Some completed them online and some completed them at the end of the face-to-face courses. We received 25 responses in total.

## Methods of data analysis

The data was analysed in two phases. First, we analysed the characteristics of the learning scenario designed and implemented during the experiment. We focused on its ability to take into account the experiences of individuals and thus to make the distance *integrative* (OIDL). Second, we analysed the questionnaires in order to obtain results in terms of the effects and transformations produced by the learners. Finally, we cross-referenced these



data in order to interpret the results of the study in terms of transformations of accompanying practices during a blended training.

The analysis of the learning scenario was based on the indicators related to the presence or absence of the *integrative distance* in the engineering of an ODL. To do so, a grid has been built, the relevance of which has been demonstrated in previous researches (Papadopoulou, forthcoming) (see Table 1). It integrates the engineering levels of OIDL. At each level, indicators are associated, as “directly observable concrete elements” (Tremblay, 1968; p.87), which may reveal the place occupied by the *integrative distance* in the learning scenario. The technological level is part of the two levels. The institutional level was analysed in the contextual part of the article. The presence of these six indicators in our learning scenario will be measured as follows: indicator present, partially present, not present.

Table 1: Grid of indicators related to the integrative distance of the ODL engineering (Papadopoulou, forthcoming).

Engineering level of OIDL	Indicators of integrative distance
Organisational level (learning engineering)	1. Project engineering
	2. Open-cooperative learning scenario
	3. Articulation of the double alternation
Operational level (accompaniment engineering)	4. Accompaniment of rhythm-training
	5. Accompaniment of affordances of tools
	6. Accompaniment of experiential training

For the analysis of the questionnaires, we created tables to have a global view based on the quantitative elements of the closed responses. We then analysed the textual elements of the open-ended responses.

## Main results and their interpretation

The results of the learning scenario are presented according to the two engineering levels divided into six indicators. Those of the questionnaires are based on a summary table of the answers given.

### **Blended scenario analysis: organizational level**

We begin with the analysis of the indicators of the organizational level corresponding to the learning engineering and the design of the blended course. This first analysis refers to the following three indicators: the presence of a project engineering, open-cooperative learning scenarios, a thoughtful articulation between presence-distance and theory-practice (see Table 1).

The *project engineering* is present in the scenario. One of the objectives of the course is to allow learners to experiment the process of creating a Portfolio. For an ethical accompaniment of their future accompanied, each of them had to create its own Portfolio project and carry out the process based on its own needs and paths. Thus, project engineering aimed to create a space for practice and experimentation of theory.

The learning scenario is open, which means that it gives a lot of freedom of action to the learners linked to its low prescription (Simonian, Quintin, & Urbanski, 2016). Indeed, no injunction was made on the frequency and the way to use the online space. Documents, videos and proposals for practical exercises and exchanges are present only for those who feel the need to refer to them. On the other hand, the indicator of distance cooperation is not present. The cooperation takes place especially during the face-to-face sessions with the organization of working groups around the practical workshops to facilitate the structuring of the portfolios of the learners. Thus, the online space only provided access to a forum to facilitate exchanges and remote assistance. We can therefore conclude that the learning scenario is only partially *open-cooperative*.

Finally, the scenario was built on the *double alternation* because it articulates theory-practice and presence-distance. More precisely, the face-to-face sessions are built between theory and peer accompaniment. This facilitates collective reflection on individual projects. A review of distance practice and portfolio advancements is also proposed. Distance sessions are built between theoretical reminders and practical work. They thus promote individual reflection on the project and invite the production of the portfolio.

### ***Blended scenario analysis: operational level***

The operational level focuses on accompanying the experiences of the learners during the implementation of the Portfolio course. Our analysis is based on the following three indicators: accompaniment of rhythm-training, of tools' affordance and experiential training (see Table 1).

The accompaniment to the *rhythm-training* is not present in the learning scenario. Learners are indeed free to work remotely according to their own temporality and pace. No accompaniment is offered on the rhythmic habits of the learner to facilitate the appropriation of their distance learning.

The experiential accompaniment to the *tools' affordance* (Simonian, 2014), which also aims to raise awareness of the distance learning approach through a focus on technical tools, is only partially present. The experimental status of the scenario leads to a low degree of intentional prescription of the use of tools. Thus, the articulation between the prescribed and the real aimed at taking in hand the tools offered to the learners, while allowing them

to adapt them to their own realities and needs. For the same reasons, the articulation between the appropriation of institutional tools and the use of non-institutional tools (Simonian, 2014) by the learners was enabled. The learners used other communication tools than those offered in the online institutional environment, in order to communicate and achieve their goals, create their portfolios. On the other hand, the lack of cooperative activities online, did not allow the establishment of a socio-emotional climate through the communication tools.

Finally, the accompaniment of the *experiential training* is an integral part of the learning scenario as the course aims to raise awareness of professional paths through the narration of experiences lived outside the training centre and the formalisation of their portfolios. This accompaniment is done both in face-to-face by the trainers and the peers through group work, as well as in distance through online resources and exchanges, theoretical reminders and practical work.

### ***Analysis of learners' feedback***

Of the learners who responded to the questionnaires, 81% visited the online space between the first and second session (first questionnaire), 88% between the second and third (second questionnaire) and 63% between the third and fourth (third questionnaire). The reasons were (a) the instauration of a new habit (go online) that students had to establish, which requires a certain amount of time, (b) the respect of learners' individual temporality, lack of time (c) the technical difficulties.

87% of participants said that the online environment was adequate and/or complementary to their expectations. Among the most cited expectations, we note the accompaniment for the realization of their Portfolios by the resumption of the content seen in face-to-face courses, access to complementary content and collective online accompaniment by the group and the trainers. They also mention the need for an accompaniment on the rhythm of the training: "For my part, it would be useful to have a small email/alert when resources are put online, I won't think systematically to go there" (P, Q1) or "allowing the possibility of seeing videos explaining a concept upstream in order to enter the context/course more easily" (N, Q1). Finally, the need to accompany the tools' affordance is also mentioned because the platform was characterized as not intuitive (A, Q1).

Regarding the consultation of online resources, on average 84% of participants consulted textual resources and articles, 68% videos between one to two times, 62% instructions for the exercises during the intersessions, and only 55% the forum space for online exchanges. While 97% of the participants felt the resources were useful, only 77% felt the same for the forum.

## **Conclusion: implications of the study in the field of adult education**

This study makes it possible to identify three main results reflecting the way in which engineering in adult education is transformed by the integration of new technologies.

By combining the analysis of the scenario and the learners' responses to the questionnaires, we realize that there is a coherence between the weaknesses noted in the accompanying engineering and the effects produced on the participants. More specifically, the cooperative aspect, the accompaniment of the rhythm-training and the accompaniment of the tools' affordance were the three indicators noted as absent in the engineering of the scenario. The criticisms made by the learners about the gaps in the training were also about these three elements based on the need for an accompaniment in: the use of the online platform, the accessibility of the resources, the individual rhythms of the learners, distance cooperation.

Our study confirms, therefore, that a simple transposition of existing practices of the face-to-face learning is not sufficient for the design and animation of an open and *integrative* distance learning (OIDL). The need to transform our practices by taking into account the elements introduced by the digital environment was then demonstrated.

However, transformation occurs only through action and in response to the environment (Dewey, 2006). Therefore, the following recommendations can be established to accompany the transformation of the practices of the adult trainers:

65. an "experiential learning" for the transformation of practices through a praxeological experimentation approach (Galvani, 2010; p.276);
66. an "experiential accompaniment" for the transformation of practices through the accompaniment of the experiences (Papadopoulou, 2020; p.306);
67. a "dialectical accompaniment" for the transformation of practices through the establishment of constitutive and interactive relationships (Basseches, 1984; p.22).

The results presented above, based on one case study, are not necessarily representative of all the engineering transformations carried out by the introduction of blended scenarios into adult training. This study needs to be refined, in particular by comparing the results with the data collected from future promotions of the Master degree or other courses. It would also be necessary to submit the same data to external researchers in order to neutralize the potential biases related to the involvement of the teachers-researchers in the course.

However, the study confirms the relevance of the OIDL engineering model and the increased importance of accompanying the rhythm-training and tools' affordance in this

transformed context. As a result, the fact remains that learning scenario, learning engineering, accompaniment engineering and integrative distance seem important to articulate when transforming traditional training into blended training in order to take into account the specificities of adult learners, their experiences and needs.

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## DEVELOPING A MODEL FOR THE TEACHING AND LEARNING OF FLUID MECHANICS AT AN OPEN DISTANCE UNIVERSITY

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### Abstract

The study explores the developing of a model for the teaching and learning fluid mechanics at open distance university. Most of the students are employed. The model emphasises blended learning, flexible learning and student-cantered learning. Fluid mechanics it a module offered at first level of mechanical engineering, which consists of two formative assessment, one submissive assessment and laboratory assignment. This study employed an activity theory as a framework. The quantitative approach was used to collect data. Data consists of student's assignments (theory and practical) final examination scores. The results indicated average pass rates during 2015 and 2017. However, the pass rates during 2016 was good. It is recommended that cognitive analysis of the student responses could improve the performance rate, quality and enhancement to teaching and learning.

**Keywords:** fluid dynamics, ODL, Blended learning, engineering, open distance learning.

### Introduction

Fluid mechanics is a Mechanical Engineering module, desired to bring the understanding of the forces and flow within fluids. Due to the rapid technological developments, this model has shifted from fully open distance learning to the blended learning approach. The blended learning is known a flexible learning and teaching method, which integrates the online course and face-to-face modes to achieve the desired learning objectives for student. This module consists of three categories:

- 1-28% Web facilitated;
- 29-80% Course content delivered online (blended);
- 80-100% Delivered face-to-face.

The assessment model consists of the formative assessment of one assignment and one practical (weight 20%). And one summative assessment in a form of examination (weight 80%).

A Blended Learning Approach (BLA), it is now a field of interests for most ODL (Open Distance Learning) researchers. BLA it is found to be more attractive because of its flexibility and cost-effectiveness, this is because it can serve to tranquilize the loneliness of rural students by simply acknowledging their existence and their challenges with module. A study on teaching and learning of fluid mechanics by applying a blended learning approach (BLA) was investigated by Rahman (2017), where the grading metrics and SFU (student feedback on unit) survey method was used for data analysis, It was found that BLA has improved the learning experience of the fluid mechanics students.

Furthermore, Blended Learning Approach should be integrated with Student-Centered Learning. Weimer (2013) indicated that the balance of power it is very important for this teaching, learning and student objectives as it enhances their knowledge about the module. A Blended Learning Approach seeks to promote the effective and Student Centred Learning, where students are also given the opportunity to interact by exchanging knowledge about the content of fluid mechanics on the discussion forum, WhatsApp groups, etc.

In addition a review of teaching and learning fluid mechanics was addressed by Rahman (2017), where the study employed quantitative approach for data collection, according to the outcomes it was found that “student-centered approach” was effective for teaching and learning of fluid mechanics. And it was also found that with the intervention of blended learning approach teaching fluid mechanics could even be more effective.

However, the aim of blended learning it is not just to improve the pass rate but also to enhance the learning and the knowledge of the student studying fluid mechanics. Even though the blended learning approach enables good interaction between students and lecturers of fluid mechanics, however we still need to consider the students' opinions about the online teaching over the traditional teaching approach. A study of identifying the student opinions about the blended learning approach in fluid mechanics course was investigated by Sarvar et al. (2018), where the questionnaire method was used for surveying, it was found that student prefers the blended learning for fluid mechanics especially where high demanding cognitive skills are needed.

Also a Blended Learning Approach to Teaching First Year Engineering was investigated by Sarvar et al. (2018), where evaluation method included student questionnaires and structured interview together with overall student performance analysis, from the examination result it was concluded that the improved performance of the student was due to a blended learning approach.

Moreover, the Perceptions of Students towards Online Learning was found to be a very interesting topic by Huss and Eastep (2017), where the questionnaire approach was



employed, and the study confirmed that students have definite perceptions about online education and what they believe to be the necessary components for their success in this environment. However, there is no doubt that blended learning approach is best appreciated by both students and lecturers of fluid mechanics in various universities because of the benefits it brings to this module. The purpose of this study is to investigate teaching and learning model given below as Figure 1 in fluid mechanics in mechanical department using ODL methods.

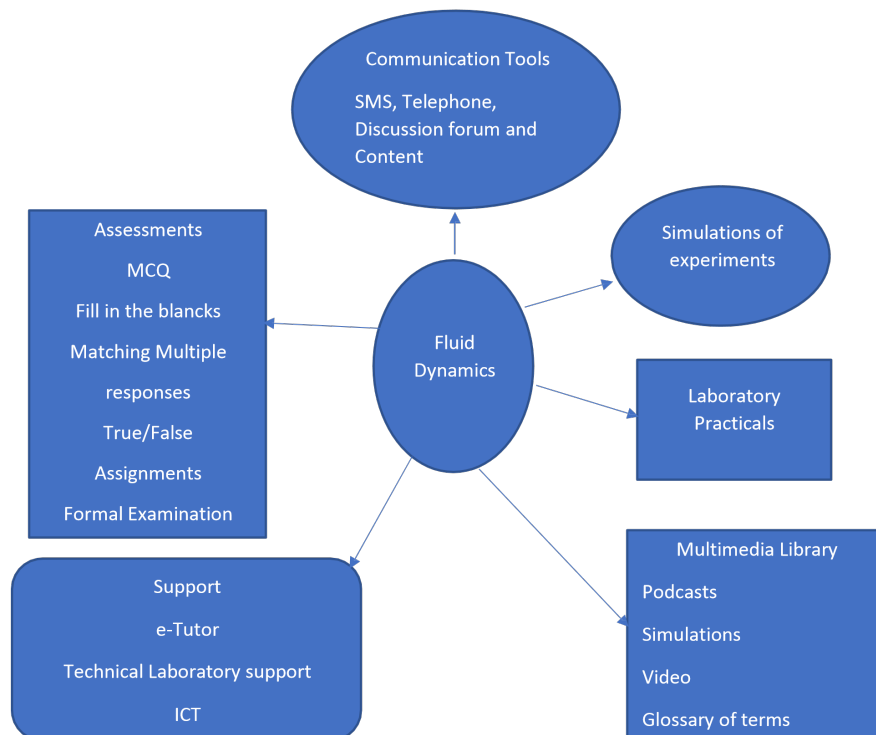


Figure 1. ODL fluid dynamic model

#### Role of e-Tutor:

- Illustrate complex problems;
- Summarizes understanding;
- Contact group discussions;
- Illustrate we solutions etc.

#### Announcements:

- Communication with students;
- Updates;
- Alert when there are changes/upgrades.

#### Discussion Forum:

- For flexible communication.

## **Theoretical Framework**

This study is guided by the connectivism theory of learning. A study of Learning Theory for the Digital Age was investigated by Siemens (2014), and he reported that connectivism theory provides insight into learning skills and tasks needed for learners to flourish in a digital era. Which simply means the knowledge travels around network of connections. This theory promotes e-learning, which is the most popular research of nowadays. Yuen and Yaoyuneyong (2011) also showed a great input into towards learning, by conducting a case study of exploring the integration of social media into online courses, where online questionnaire method was employed, and the results of the study showed that students found e-learning approach very positive and encouraging because of its flexibility such as (easily access course content, interact with content and with others, construct new knowledge, and collaborate with others to form a learning network).

Furthermore, e-learning approach enhances teaching, learning and promotes blended learning approach. Prior research clearly indicated that the connectivism theory should be employed by this study to enhance blended learning approach of teaching and learning of fluid mechanics.

## **Methodology**

The focus of this study is based on fluid mechanics first level, which is currently a semester course in mechanical engineering at UNISA. The student population is approximately between 60 and 90. The assessment model for this module consists of the formative assessment of two written and practical assignment (weight 20%), and one summative assessment in a form of examination (weight 80%). The quantitative method was employed by this study, where the overall performance of students was obtained from the final examination data. The evaluation includes the number of student registered, assignment performance and final exam performance. A sufficient support for this module is it provided through the Learning Management System (LMS) known as MyUnisa. Savar et al (2018) indicated that, through LMS it is convenient to determine the activeness of the students, and it also allows flexible interaction between students and the lecturer

## **Results**

The overall students' performance results are displayed in Figure 2 below for both the assignments and examination. From the results it could be clearly seen that the intervention tools have the positive impact towards the student performance rate, however further enhancement of the interventions is required for this module. The results below demonstrate only the number of students passed during the semester over the total number of the students registered.

The historic performance is represented by a bar graph below, where the red area represents the poor performance of the students, yellow area represents the average performance of the students and the green area represent the enhanced performance of the students.

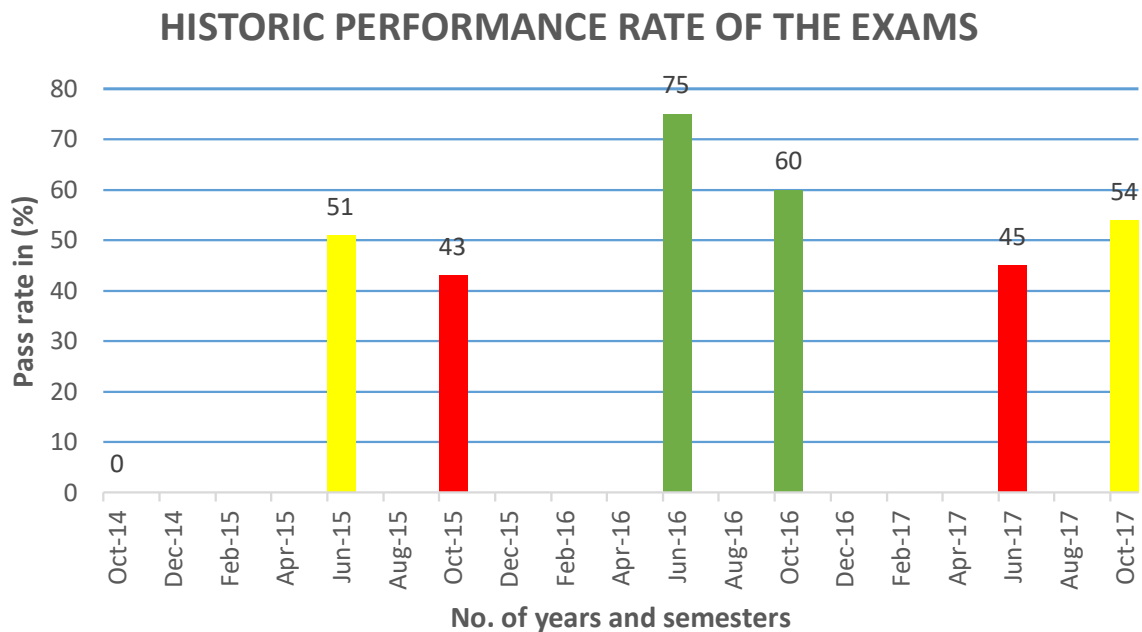


Figure 2. Examination results

## Discussion and Conclusion

From the results enhancement of the interventions is required for this module. Study of fluid mechanics seem to be very challenging for students. This type of performance requires more interventions, most importantly to encourage the student to utilise MyUnisa platform for their study.

Due to the low pass rate of fluid mechanics it is recommended a cognitive analysis be employed for this module and encourage more of student centered method of learning (Wright, 2018). However, BLA portray encouraging results towards teaching and learning of fluid mechanics (Rahman, 2017). Majority of the students have over 50% rates.

The purpose of the study was to investigate the effectiveness of the fluid model which is encourages flexible teaching and learning which could help to enhance the quality, improve performance, teaching and learning of the fluid mechanics. From the results it can be concluded that during the past years, this module has been challenging for the students to learn.

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## **CASE STUDY: ATTITUDES OF ELTE STUDENTS TOWARD SPORTS DURING THE 2020 COVID-19 PANDEMIC**

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### **Abstract**

In the spring of 2020 during the coronavirus pandemic, teaching of physical education at Eötvös Loránd University continued in the virtual space. Physical education teachers conducted an online training program weekly for students. It was a significant challenge for teachers to change the curricula overnight to support students' physical activity needs and to motivate them as required. In our study we examined the effectiveness of the 7-week online physical education program based on feedback from 264 non-athletically competitive university students. This virtual experience provided instructive results, which support the introduction of blended physical education in higher education.

**Keywords:** COVID-19, virtual physical education, higher education, physically active lifestyle

### **Introduction**

At Eötvös Loránd University in Budapest, physical education is an optional course for students every semester. The University offers some 25-30 different courses, including outdoor (hiking, skiing, cycling, etc.), indoor (sport games, conditioning, dancing, etc.) and aquatics sports. The students participate in 60-90 minute lessons (depending on the course) weekly led by physical education teachers. The conditions for awarding credits hours are determined by the teachers.

At the beginning of the COVID-19 pandemic on March 15, 2020, the University offered students the opportunity to complete these courses online or drop them without consequences. In the 2019/20 academic year, almost 900 students signed up for these P.E. courses and 687 continued through the end of the semester with the distance learning component.

Physical educators at the university faced a serious challenge, as in previous years classes were held 100% face-to-face. The university's e-learning platform had primarily been used as a communication interface rather than an educational tool. Furthermore, domestic articles were entirely unavailable, and there was limited guidance from international studies (Daum & Buschne, 2012; 2014; Williams, 2013) which primarily presented experiences from fitness courses.

## **Aims**

During the rapid shift, the following educational goals were set for the 7-week online physical education courses:

- Maintain general fitness levels;
- Self-regulated implementation of a physically active and healthy lifestyle with virtual assistance.

## **Methodology**

The programs were conducted through the university's online system, where teachers uploaded movement programs. Students were provided a suitable warm-up for each program and a stretching program for the end of the session. The duration of the online course was 7 weeks, and students could choose from the following programs: Conditioning, aerobics, posture improvement, dynamic yoga, hiking/running, cycling and healthy lifestyle (as a theoretical course.) Students were free to choose a new program weekly, or stay with one program throughout the 7 week period and monitor their progress. Moreover, they could participate in multiple programs per week according to their attitude and time. Students were required to send feedback on a weekly basis based on the criteria given. The reports had the following dual purpose:

68. To provide information and feed-back for teachers on whether is it necessary to modify the virtual curriculum;
69. To provide for self-reflection by the students in which their movements and results (e.g. Strava, heart rates, calories, etc.) were recorded and evaluated.

The virtual content was provided in various media, including descriptions, drawings, and demonstrations videos.

## **Questions**

The purposes of the study were as follows:

- To analyse the extent to which distance learning can maintain regular physical activity in students, and determine whether the differences between individual and team sport athletes.

- To evaluate the extent to which the 7-week distance learning succeed in transferring the theoretical and practical foundations of a physically active lifestyle to university students. It was assumed that by the end of the course they would be able to develop their own exercise program according to their own needs.

## Study Group

The online questionnaire was completed by a total of 384 students in the final days of the semester from May 11-24, 2020.

Table 1: Study group

	Competitive athletes		Recreational athletes		Not active		Total
	Female	Male	Female	Male	Female	Male	
Team sports	14	20	25	15	N.A.	N.A.	74
Individual sports	4	6	157	67			234
	18	26	182	82	53	23	76
Total	44		264		76		384

In the study the 264 students were examined who regularly practiced sports at a recreational level, in addition to the university P.E. class, before the pandemic. The sample consisted of BSc, MSc and Ph.D. students born in 1979 -2001. The distribution of residence is described in Table 2.

Table 2: Type of sport that was practiced by place of residence.

	Capital	Small town	County seat	City	Total
Team sports	12	6	5	17	40
Individual sports	88	34	37	65	224
Total	100	40	42	82	264

## Results

During the restrictions, 42% of students continued to exercise regularly in addition to the online courses. While 35% of team athletes continued to exercise, this increased to 43% of the individual sport athletes.

However, a closer look at the results (Table 3) shows that among the team athletes a large proportion ceased training in the capital, while among those students living in cities only 1 person stopped training regularly. In individual sports, a high proportion of students living in county seats and cities stopped training (69% and 62% respectively), while only half of those resident in the capital and small settlements gave up regular exercise.

**Case Study: Attitudes of ELTE Students toward Sports during the 2020 Covid-19 Pandemic**

Table 3: Did you exercise during the COVID restrictions? (by place of residence)

	Yes	No	Total
CAPITAL	45	55	100
team sports	2	10	12
individual sports	43	45	88
COUNTY SEAT	13	29	42
team sports	1	4	5
Individual sports	12	25	37
CITY	34	48	82
team sports	9	8	17
individual sports	25	40	65
SMALL TOWN	19	21	40
team sports	2	4	6
individual sports	17	17	34
Total	111	153	264

Prior to the restrictions, 34% of students spent less than 3 hours per week on physical activity and 46% spent 3-6 hours. The rest of the students spent trained for over 6 hours per week. (Table 4)

Table 4: How much time was spent with physical activity per week before the restrictions?

	More than 10 hours	7 - 10 hours	3 - 6 hours	Less than 3 hours	Total
Team sports	3	10	18	9	40
Individual sports	6	32	104	82	224
Total	9	42	122	91	264

Of the students who barely exercised before the pandemic, 48% increased their weekly workout hours; while 14% have reported no change. For those who exercised 3-6 hours or 7 and more hours weekly before the restrictions this favourable change was not observed. (Table 5)

Table 5: How weekly activity developed during the restrictions

	More than 10 hours	7 -10 hours	3 - 6 hours	Less than 3 hours	Total
Significantly decreased	2	14	33	27	76
team sports	0	6	7	2	15
individual sports	2	8	26	25	61
barely decreased	4	8	36	7	55
team sports	1	2	6		9
individual sports	3	6	30	7	47
same amount	2	8	18	13	43
team sports	1	1	2	4	9
individual sports	1	7	16	9	34
increased	1	12	35	44	92
team sports	1	1	3	3	8
individual sports		11	32	41	84
Total	9	42	122	91	264



Based on the above, it appears that the virtual physical education program partially maintained student mobility. Motivation was more successful among students engaged in individual sports; however, the place of residence and previous training regime also appears to impact the results.

The second part of the questionnaire investigated the extent distance learning can influence students' quality of life through movement.

In the questionnaire, 74 students responded that they had pains during the pandemic that they had not experienced before. It is likely that the sudden onset of sedentary life and the significantly increased hours in front of the computer caused these problems. Of these students, 66% were able to relieve or eliminate their pain with exercise. Individual and team athletes were similarly successful (Table 6).

Table 6: Did exercise reduce pain?

	Team sports	Individual sports	Total
Yes	8	41	49
No	4	21	25
Total	12	62	74

By the end of the 7-week course, 226 students reported that they could create an exercise program based on their own requirements. (Table 7) Most selected a series of conditional exercises and 131 students (including 17 team players) stated that they also knew the danger of injury of the program they had put together.

Table 7: Could you put together an exercise program to suit your own needs?

	Team sports	Individual sports	Total
Yes	34	192	226
No	7	34	41
Grand total	41	226	267

While only a small number of students reported negative signs of a sedentary lifestyle, the study period was barely two months and the participants were young people in their twenties. More importantly, by the end of the online course students who previously led an active lifestyle were able to put together an exercise program that helped maintain physical and mental balance. Unfortunately, barely half of them were aware of the potential for injury and other movement related hazards.

## Summary

Overall, the study suggests that distance learning in physical education can be useful for students in higher education, including participants in both team sports players and individual athletes. The study showed that individual athletes are more open to virtual training, which can be traced back to the feasibility of adapting existing practices to the

lock-down environment among other things. Based on the feedback, students exercised more hours than during the face-to-face course, as the programs were always available and the number of repetitions was not limited. True, the majority of respondents stated that their biggest concern was the lack of immediate feedback and community.

## **Recommendation**

Whether we are talking about online or face-to-face education in the future, it is important to consider that

In order to better differentiate the students at the start of the course, a short questionnaire should be given not only on sporting experience and future expectations, but also on movement habits (e.g. weekly regularity, timing during the day, etc.) and circumstances (e.g. individual or group, outdoor or indoor, etc.)

For university students, where one of the main tasks of physical education classes is to develop a physically active lifestyle, hybrid education can actually increase effectiveness. The blended method provides the following benefits:

- During face-to-face teaching sessions, teachers focus on proper body position and accurate movement execution.
- During independent training sessions, students develop a regular active lifestyle with guidance but without supervision.

In the future, we must consider the opportunities and challenges of blended learning, to the benefit of our students who will be more physically active and have a healthier life after the graduation, too.

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## EDUCATORS COMPETENCES FACING CHALLENGES OF DIGITAL TRANSFORMATION: A BRAZILIAN EXPERIENCE

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### Abstract

Since March 11, the world has faced a major transformation in daily life, especially in the functions of professionals, with the announcement of the Covid-19 pandemic. New practices were implemented, and, in the educational area, educators began to deal directly with the evident need for technical and emotional skills in professional practice. The United Nations Development Program indicates, including through a framework, the importance of applying skills in professional practice. Education is no different, the program established those that should be the four pillars of education for the 21<sup>st</sup> century: learn to know, learn to do, learn to live and learn to be. Within this context, this article presents actions taken for in-service training of public-school teachers in the State of Rio de Janeiro.

**Keywords:** Digital Competences; Digital Transformation; Public Basic Education

### Introduction

In the last six months, due to the Covid-19 pandemic, as part of the challenge promoted by the educational disruption to which we were exposed, comes the need to deeply address remote learning and open and distance learning (ODL). In Brazil, the use of digital spaces to guarantee teaching and learning opportunities for all is still a problem, as professionals are not sufficiently trained in the application of technological mediation in education, in addition to the physical and technological infrastructure difficulties faced by public education. In this scenario, the Open Educational Movement and Practices, based in stimulate technical and emotional competences, are here to stay as a way for maintaining, at least in part, the functioning of the schools and universities.

Providing lifelong learning for all is an objective of UN-Agenda 2030. Vocational training is an ongoing effort to evolve, which allows for inclusive, equitable and quality education through educational actions around the world. It is important to highlight that the greatest

professional gains lie in the particularity of all this experience to have occurred in a developing country like Brazil, a country that, due to its unique characteristics - having certain aspects of economic development as intense as the richest countries and, at the same time, regions where the human development index reaches very low levels, guarantee a wide world-like view of the diverse realities.

In the beginning of April, a Committee of Specialists from 7 Brazilian Public Higher Education Institutions (UFPE, UERJ, UFMT, IFES, Unifesp, UnB, UFRN), 1 Non-profit private HE institution (FGV), 1 international ODL organization (ICDE) and two Brazilian ODL Associations (ABED, Unirede) was formed with the objective of supporting the State Department of Education of the State of Rio de Janeiro, together with teams from the State Public Education Network, in the actions of maintaining remote learning, according to UNESCO – #LearningNeverStops. The main need was to fill and close the gaps in the professional training of educators without experience in the use of Digital Information and Communication Technologies. Among the initial planned actions was in-service training as a way to support the entire network with 40,000 educators from elementary to high school and vocational programs involved, not counting all the administrative and pedagogical staff involved. In Rio de Janeiro, a group of specialists is organized in order to provide students in the State Public Education network with remote learning, through technological mediation, without neglecting the importance of the teacher-student relationship.

The “Education in Debate” Project (Projeto Educação em Debate – Open Sessions, 2020) brought a range of topics that covered contents focused on the practice of Open Distance Learning exposed by remote learning which was the most important option to face educational disruption caused by the pandemic. The role of technological mediation was addressed in its punctuality, especially considering the vulnerable and low-income populations of which a large number of students and families are part. For the selection of topics and speakers, the Committee took into account the European Framework for the Digital Competence of Educators: DigCompEdu (Redecker & Punie, 2017).

To better understand the development of the project, after this introductory section in the following sections, we present the methodological approach, discuss the main results and present final considerations.

## **Materials and Methods**

The initial project planning was provided for 8 open sessions. With the development of the project, the outcomes presented were encouraging and the group of participating teachers demanded new sessions grouped in two new rounds, totalling 17 sessions. The average number of attendees per session was 1,200.

## Competencies

Based on the European Framework for the Digital Competence of Educators: DigCompEdu (Redecker & Punie, 2017) and core competencies from The Competency Framework – United Nations Development Programme (UNDP, 2008) we define three cycles of presentations, as shown in Table 1.

Table 1: Cycles and Target Competences

Cycle	Target Competence
Sessions 1, 2, 3, 4	Ethics and Values Appropriate and Transparent decision making Organizational Awareness
Sessions 5, 6, 7, 8, 9	Communicating Information and Ideas Self-management and Emotional Intelligence Conflict management   Negotiating and Resolving Disagreements
Sessions 10, 11, 12, 13, 14, 15, 16, 17	Developing and Empowering People   Coaching and Mentoring Knowledge sharing   Continuous learning Working in teams

The model presents a grade of a proficiency levels. Most of our attendees were placed as a Newcomer, level A1. As mentioned, (Redecker & Punie, 2017; p.30)

*“Newcomers are aware of the potential of digital technologies for enhancing pedagogical and professional practice. However, they have had very little contact with digital technologies and use them mainly for lesson preparation, administration or organisational communication. Newcomers need guidance and encouragement to expand their repertoire and to apply their existing digital competence in the pedagogical realm.”*

And a minor group was considered as Explorer, level A2.

*“Explorers are aware of the potential of digital technologies and are interested in exploring them to enhance pedagogical and professional practice. They have started using digital technologies in some areas of digital competence, without, however, following a comprehensive or consistent approach. Explorers need encouragement, insight and inspiration, e.g. through the example and guidance of colleagues, embedded in a collaborative exchange of practices.”*

## **Sessions**

According to this type of proficiency level, we started to schedule the sessions. The sessions were defined in panel format, involving 2 to 4 speakers and a mediator. Mediation was carried out by a specialist from the Committee of Specialists. All the video material was recorded and are open educational resource, licenced with CC Attribution – ShareAlike 4.0 International.

## **Results and Discussion**

Working on real-world problems usually requires the combination of different kinds of specialized and context-dependent knowledge, as well as different ways of knowing (Markauskaite & Goodyear, 2018). Defining the panels sessions, we were anxious to achieve this balance. It is important to highlight that all sessions were linked to the sustainable development goals 2, 3, 4, 5, 6, 8, 9, 10, 16 and 17 (United Nations, 2015).

In the first cycle of sessions, we emphasize skills related to ethics and professional values, the importance of having the right data ensuring appropriate and transparent decision-making and an organizational awareness as a way to promote the commitment of management and employees. Four sessions were realized, and the main themes were:

- Public Education, Pandemic and International Cooperation: #LearningNeverStops – In this first session we brought the importance of lifelong learning looking at Sustainable Development Goals – Agenda 2030.
- The new teacher: challenges of education in times of pandemic – The main point discussed in this session was the importance of technological mediation in remote education. Teacher training was discussed with a focus on non-classroom teaching activities, innovation in professional practice and new skills in the digital age.
- Technology, digital inclusion and social inclusion: are we ready? – This session was characterized by the presentation of research, carried out in 2018 (Cetic.br, 2018) and studies on the use of Information and Communication Technologies in Brazilian schools. The discussion was directed to the reality of the population and vulnerabilities related to remote activities in public schools. The majority of the population is poor and lacks food, support and security, mainly domestic.
- The legacy to post-pandemic education: technological mediation, open educational resources and more open and flexible education – Once in distance learning, topics related to student and teacher learning guided the discussion. Questions such as developing material for the remote classroom, working on motivation and encouraging participation, dealing with remote schedules, contrary to what is done in face-to-face education, were answered by addressing topics such as Open

Educational Resources, Open and Flexible Learning reinforcing the importance licensing and copyright.

In the second cycle of the sessions, the work focused mainly on supporting the development of activities, considering the return of classes in remote format for vulnerable populations. The main themes were:

- Evaluation from the perspective of new educational methodologies – This debate specifically addressed student assessment issues in remote learning. Brazilian legislation was the focus.
- Health and Education: Essential Binomial – The return to face-to-face classes is strongly related to issues of assistance and public health. With the Covid-19 cases and the possibility of a return, in the new normal, representatives of the state government of Rio de Janeiro brought their contributions and made their considerations.
- New ways of thinking about goals and Contents in Education – The physical distance brought up important social issues. This session discussed creative alternatives in the teacher-student relationship in virtual environments. Technical and emotional skills were evidenced.
- The inclusion of vulnerable populations in the new educational process – Work in the Brazilian and Portuguese prison system, in times of pandemic, was carried out in this session.
- The return to school life after pandemic – Practices and solutions from Portugal were presented, in view of the ongoing actions in Brazil to return to face-to-face activities in schools and universities.

The last cycle brought discussion and concern with actions to resume face-to-face activities. The organizational vision is extremely important, and the commitment established with the community of parents, employees and public authorities, brings the educational institution as a link. The debates were:

- Competences and remote learning: a look at the Common National Curricular Base – This session explored the competencies defined for early childhood, secondary, elementary and professional education, by the Ministry of Education.
- Teaching and learning from the perspective of technological mediation – Network partnerships and cooperation were presented and encouraged as alternatives to balance institutional demands.
- School and educational planning in the current context – Educational institutions are concerned with defining their hybrid education plans, as well as return protocols according to the health and public health situation in each state. This session discussed important points for knowledge sharing and continuous learning.

- School and learning assessment in the current context – How to deal with learning issues and effective understanding of the contents taught? The basis for discussion is reasonableness and protocols established.
- School and the challenge of permanence – In this session the focus was the largest disruption of education systems and impacts from closures schools in low and lower-middle income countries (United Nations, 2020).
- School and innovative practices in today's context – Second Open Session dealing with Innovation as a pillar of blended learning particularly during and after the pandemic
- Innovative Practices in Blended Learning – Innovation is a pillar of blended learning particularly during and after the pandemic.
- Can we resume face-to-face activities in schools? What Science says – In this last Open Session, with the participation of the former highly recognized former Brazilian Minister of Health and the Chief of Cabinet of the Extraordinary COVID-19 Secretariat, just in the planned return weeks, openly show scientific data to show that we are ready to go blended.

All debates had a good participation and interaction by the state public teachers and other professionals who attended the sessions. The speakers played a fundamental role, bringing important experiences in the most diverse areas of domain.

## **Final Considerations**

We still have a lot to do. We reflected on the post-COVID-19 and the adequacy to UNESCO recommendations. We have the challenges of thinking about how schools will reopen and the protocols to face the pandemic in the school setting; the gradual return to face-to-face activities; how to support staff and students in regard to mental health, which may have been affected by physical distance and the various losses that students and staff faced during this year; implement actions that guarantee the return to school of all students so as to avoid school dropout; develop actions that guarantee the resumption of studies; and, always attentive to the principle of equity, provide adequate learning opportunities for all, identifying the needs of each student; and validating the learning process and the workload of the activities developed during physical distance.

Above all, we are absolutely committed to the “Futures of Education” when “learning never stops” and no one will be left behind.



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## WHAT MIGHT THE PANDEMIC HAVE DONE TO AND FOR HIGHER EDUCATION?

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### Abstract

What is the educational response to Covid 19 doing to our humanity? The paper considers the disruption to the diversity of teaching approaches and the dominance of on-line teaching in universities. It asks the question, with the intent of discussion, “Are we really aware of how the dominance of online learning is affecting our humanity?”

**Keywords:** Technological way of being, Covid19, Heidegger, individual identity

At the outset I want to state that I do believe that Covid is a serious health, social, economic and moral problem. Covid 19 exists and can bring huge sorrow and suffering. It is real and it is discriminatory. It finds the injustices in our society of poverty and ethnicity and exploits them in its own destructive ways. The palliative of a vaccine will disguise the underlying reason for this and possibly all pandemics but the solution is change; massive change in our societies to liberate people to be themselves, to be individuals and remove the shackles of being the same. This is an educative problem both within and external to our institutions of education. For many, the Covid 19 pandemic has brought heroic moments of kindness, of empathy and of caring, countered by untruths, power grabbing, insensitivity and bad faith. Certainly, instances of the bad are becoming more prevalent as the impact of the more compassionate acts fades into familiarity. What the pandemic has done, I believe, is to highlight for many the need for companionship, friendship and love in a very personal way and often in ways that transcend the ability of our technological age to satisfy.

Those ideas retained, for the most part, anthropogenic notions of reality and sought to harness technology as a tool in the hegemony of humanity rather than, as Epstein (2012) suggests, a transformation in humanity where our being became that predicted, although not ridiculed, by Heidegger (1977) as a technological way of being. The new epoch is not post- anything but rather a transformative otherness which transforms notions of self, nature and culture. It goes beyond the reshuffling of post-humanism to a reinterpretation

of humanity itself. It is imaginative transmutation of postmodernism and the hidden continuity of privilege that underlies its conceptual roots.

It is with Derrida's (2001) comments and the more recent paper of Mui and Murphy (2020) in mind that I wish to question Covid 19's influences on the rapid adoption of online teaching, virtual learning platforms, "smart content" creation, AI-driven chat robots and deep learning, on the higher education which has produced profound and disruptive effects of the digital transformation of knowledge. For sure it has placed, to use Derrida's phrase, the technician academic at the centre of knowledge dissemination. Certainly, forms of technology which are harnessed to help humanity flourish are valuable and, in that, the development of vaccines can be one technology-driven activity worthy of note. However, exploitation by the privileged is simply exaggerated if vaccines are not provided patent-free and nations buy up supplies just because they might need them, leaving others needing therapy or immunisation wanting because of their greed and the self-interest of others: white middle classes to the lifeboats first?

Being locked away from the outside world feeds images of close friends and family through an electronic representation of them, prevented from testing their existence other than through the collection of pixels that configure a reality we have come to accept as real and feed images of a world variously winning, defeating and surrendering to the enemy of Covid 19. We are encouraged to go about our lives in these technological cocoons, losing familiarity with other ways of being, captured in a Heideggerian cave, waiting, not to be liberated but to accept the new normal. Encouraged by the ascetic of the present through the lens of political self-interest, leaves us entrapped in the same delimiting environment, to be motivated to practise restraint by how difficult it is for those who make decisions to keep us in such servitude yet who are exempt because of the pain they bear for us. When we are in need to gather, to break out from our technological, enforced isolation, we are chastened and sent deeper in the cave to learn the lessons of conformity.

If this is not sufficient, we are subjected to the "the games", where those forced into service of gladiatorial harmony fight for our pleasure on the battlefield of team sports, or we are fed past recordings, both fictional and "real", of the way we were. These nostalgic episodes provide us with the reassurances of our own heroic behaviour in confronting the past and moving forward into the new normal where companionship and humanity are refined to make us always dependent on the owners of the technology which defines our new normal. Reward comes from returning to the real world of work only to be subjected to deep quarantine if the rules of parole are broken. Guilt is layered on familial, local, national and international images of those whose woe is created by people just like us who carelessly and selfishly put our interests above the collective. Releasement comes with physical distancing, face masks to hide our emotions and a focus on work to ensure we can sustain

the new order. We are like contestants in game shows where the judges have nothing to lose compared to us but who expect reassurance and sympathy for their risk-free decisions.

Heidegger (1962) describes this temporal notion of time as not our ordinary understanding of time. This time levels off and covers up the temporality and shows itself as a sequence of “nows” which are constantly “present-at-hand”, in contrast to the readiness-to-hand of equipment, which are simultaneously passing away and coming along. Time is understood as a succession, as a “flowing stream” of “nows”, and as the course of time (p.474). Such a temporalisation is encouraged by the provision on open access on-line learning, accessible to be consumed whenever it suits the need of consumption. This fetish of consumption is spreading more rapidly than the pandemic, encouraging education to be used not realised: to be packaged not experienced and to be defined by effectiveness metrics of use rather than changes in the being of the learner. Simpson’s (1995) temporalisation of knowledge is helpful to draw more distinctly the separation I wish to highlight. She argues that: “the technological project’s focus is on securing an end, its attitude towards temporality is that time, in its unruliness, must be domesticated, must be brought under control. Opposed to this, praxis fully recognises time as its field of action and as an enabling medium – for instance, the meaningful action of praxis as an application or repetition of the past understood as an historical legacy – and seeks, ideally, to maintain the singleness of individual identity through the vicissitudes of temporal existence.” (Simpson, 1995; p.57).

So what might be a solution to the totalising of convenience education, facilitated by technology and transformed for mass consumption by the onset of the humanity degenerative impact of the pandemic? One response might be to reclaim our individuality and agency. Freedom resides in our choice to act on our potential, and potentialities are aligned with the properties of the *haecceitas* (the thingness of a thing) that determines its powers to act. Thus, not all the properties of a thing are equally important to the understanding of the specific activities, relationships, commitments, etc. which give meaning to an individual’s identity but all contribute to our potentialities to realise our potentiality to be. The exploration of our being provides the potential for us to understand our life project and to seek it; to understand being as our becoming. It is not deterministic, but neither is it unencumbered; it requires a blending of knowledges and realities in order that we might have the power to reflect and deliberate about the impact to be achieved by our actions. Our individuality is the freedom with which we make choices as to our becoming in the flux of this unity, and education might function to offer a lens on the dignity of humanity. We need to take a stance on ourselves and it is our individual historicity and our future possibilities that need to be disclosed so that we might truthfully take this stand on ourselves, and our formal education, among its other functions, should facilitate this. It will require a stringency and resoluteness in educational

institutions' activities which will reveal the importance to our being. This needs disclosure of a way of being in the present besides the generalised way of being of others which, I perceive, is current in ideas such as performativity. If education institutions do not take up the challenge, but dwell in the tranquillity of external directives, always ready-to-hand to shape a future, they will fail their communities and embrace the type of instrumentalism advocated by those who would wish to control and manipulate. Such an education is susceptible to turning scholars into workers whose choice of possibilities is crafted by others in the spirit of machination.

A way of realising the potential that resides within us to do this, as a capability *to become*, is to perceive the potential for action in the form of the realities of the transcendentals. In more detail, achievement requires activities full of political, social and economic power, and we make our *being* feasible (a) by questioning the reality of our everyday experience in the knowledge we have of ourselves and (b) with a preparedness and courage to create new knowledge of ourselves from the engagement.

How might we cultivate our will through beauty, unity and truth in all we do in our everyday lives and how might we attune to this in our being? Such attunement is required, for the media all too often presents the ugly and vile, not the beautiful, the good and the true and we might thus lose our capability to reflect *in situ* on the negative potential of our willed actualisation rather than the good that is present and unrealised. By making the effects of the balance of particularities and singularities conspicuous in the different ways that they are comprehended through discussing and sharing meaning, the mystery and wonder of experiencing beauty, unity and truth can be contextualised in all discourses.

Our individuality is the freedom with which we make choices as to our becoming in the flux of this unity and education might function to offer a lens on the dignity of humanity. This requires a reversal of the concentration of power in government and its agencies, which is exercised more easily on a homogeneous mass than when engaging with free-thinking individuals. Such a position has obvious pedagogical interventions, especially where students self-develop as a central to, rather than by-product, of education. It structures curriculum to be of both political and moral relevance to a world in which the students exist as individuals and it develops self-agency. There are difficulties in trying to integrate freedom and moral self-cultivation and the use of ready-made lists of values to be internalised by students is clearly inappropriate, for they carry the colonising tendencies of the dominant power and thus value system.

Clearly, education at all levels cannot, on its own, change the world, but it can advocate notions of transformation and, especially, embrace a notion of transdisciplinarity with the cultivation of teaching and researching as *phronesis*, *phantasia*, and *parrhesia* that resists

a simplistic rendering of a critical and technological understanding of being but allows us, as advocated by Heidegger, to learn how to think anew. Through insight in the present the lamination of realities as we know them will seem as nothing as we become able to live in non-human ecologies. To cope, we need to develop transdisciplinary pedagogy as a patterning of thinking in and beyond complexity. The more we use our imaginations to widen the limits of our world and, in so doing, the more thinking will become poetic and thus prophetic. New knowledges can be formed and can merge under epistemologies of meaning and, if the technologically- enhanced potential of our being is awoken, the next epoch will be post-nothing.

This paper has attempted to raise an argument for us to work harder to imagine and find ways which respect the ecology of humanity and not reshape it through our attempts to provide education. It is not to deny the benefits of technology but to ensure it is harnessed for educative purposes to enable humanity's flourishing, not to facilitate the decline in the value of education through opportunistic use of economically-devised methods of knowledge dissemination. It is to open or perpetuate a discussion on how we shape our future as technology (intentionally or not) destroys our environment but physically, intellectually and emotionally and what we might do to prevent that.

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## COMMUNICATION AND INTERACTION FROM FACE-TO-FACE TO ONLINE EMI DEGREE PROGRAMMES IN THE STUDENTS' PERSPECTIVE – A CASE STUDY

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### Abstract

The proliferation of EMI degree programmes, which are completely taught through the medium of English, has risen steadily in Italy over the last two decades, especially at master level. Along with English proficiency, interaction and communication are key factors in the success of EMI programmes even though they have been matter of concern during the COVID-19 emergency, when all classes were suddenly forced to shift online. More specifically, students of EMI degree programmes in “Medicine and Surgery” and “Nursing” were impacted because they used to work and study in groups, to interact with patients and classmates and to receive immediate feedback from lecturers.

Though unplanned, emergency remote education (ERE) has allowed students to attend classes and take exams. However, it has also shown that interaction and communication could have been handled better. First, this study aims to investigate how these issues were dealt with during the emergency; second, it enquires what lessons can be learned from the sudden transition onto digital platforms. After experiencing ERE, 102 students from various Italian universities have filled in an online questionnaire reflecting on how interaction and communication were mediated during online classes or video lessons. On the one hand, their reflections have provided insight into challenges for EMI pedagogy, which had already been identified in the face-to-face modality but were exacerbated during ERE; on the other hand, their suggestions could be useful to improve future EMI classes. Data has shown that specific training in digital tools, standardization of the lessons' format, more interaction and investments in better platforms are considered to be key aspects to implement and promote in EMI courses in the forthcoming years.

**Keywords:** higher education; English-medium instruction; EMI; online learning; ERE.

## **Introduction**

As a consequence of the globalized and connected world, the proliferation of English-medium instruction (EMI) degree programmes, which are completely taught in English, has grown considerably throughout Italy over the last two decades, especially at master level (Wächter & Mainworm, 2014; Brogginì & Costa, 2017, Cicillini (bis), forthcoming). Due to the increasing interest of universities in attracting international students and the attention of Italian students to have experiences abroad, more EMI degree courses are bound to be implemented in the forthcoming years. However, despite the steadily growing interest, concerns have arisen on the generally low levels of English proficiency, hindered interaction and understanding, and possible impoverishment of quality standards in comparison to courses taught in the students' mother tongue (Costa & Coleman, 2013; Pulcini & Campagna, 2015).

Along with English proficiency, interaction and communication are major challenges for the success of EMI degree programmes (Drljača Margić & Vodopija-Krstanović, 2018) and have been issues of even more concern during the COVID-19 emergency. In the late winter of 2020, the whole education system was forced to move onto digital platforms and classes, which until then had been taught in person, had to be offered online. Consequently, all students and lecturers had the chance to experience distance learning and all the EMI degree programmes in Italy had to be suddenly transformed into online courses. Although it was emergency remote learning (ERE), a term referring to the unplanned response to an educational emergency (Bozkurt et al., 2020), this massive experience of distance learning has provided interesting insights into EMI pedagogy.

This paper focuses on students of “Medicine and Surgery” and “Nursing” EMI degree programmes and aims to contribute to the discussion about critical aspects of the related pedagogy. More specifically, this study deals with the changes in interaction and communication, which were experienced by students from several Italian universities during the lockdown. In the first part of the present paper, the theoretical framework along with the research questions and methodology will be presented. In the second part, quantitative and qualitative data will be discussed to identify key aspects relating to interaction and communication, which impacted significantly on “Medicine and Surgery” and “Nursing” EMI students during the emergency and could contribute to implementing EMI pedagogy both in online and in-person classes.



## **Theoretical framework**

In this study on EMI degree programmes, communication is intended as the act of giving information and sharing knowledge on a subject matter in a multicultural and internationalized environment and through a common language that is English. Considering the presence of both local and international students with different cultures, mother tongues and backgrounds, intercultural communication (ICC) in EMI classes plays a key role in creating a positive learning environment and conveying the meaning. In such a context, behaviour, body language and language use may influence the learning experience and the quality of communication and interaction (TAEC EMI handbook, 2019).

Interaction, which is intended as the mutual or reciprocal influence and exchange of information is intertwined with communication and as Moore (1989) suggested, it may assume different shapes depending on the people involved. He identified three types of interaction: learner-learner (relies on the collaboration between learners with similar knowledge of a certain discipline); learner-instructor (relies on the exchange between teachers and learners); learner-content (in which students learn from the subject, the materials and references provided) (Moore, 1989; Cicillini & Salusso, 2019).

In the EMI environment, effective communication and interaction have proved to be challenging and difficult to promote because different cultures and levels of language proficiency coexist within the same class. Given the variety of languages, cultures and learning styles, interaction and communication may be interpreted differently, especially by those students who are not used to interact and to actively participate in class. Dealing with these issues may be particularly challenging also for lecturers who have to deliver specialized content, give feedback and facilitate interaction. Although there is very little published research on interaction at the tertiary level of education in EMI classes (Macaro et al., 2017), some research reports that some lecturers do not feel confident when they have to teach through English and struggle when it comes to answer students' questions and mediate interactions in live classes (Dafouz Milne & Sanchez Garcia, 2013; Borsetto, & Schug, 2016). Indeed, the use of questions in EMI classes as a strategy to foster interaction seems to be often avoided by those lecturers who do not feel at ease in communicating through English, mainly for fear to lose face and credibility with their students (Drljaca Margic & Vodopija-Krstanovic, 2018). Another strategy used by some EMI lecturers to foster interaction is the use of both English and their mother tongue, especially when communication becomes difficult to manage (Macaro et al., 2017). Code-switching may be an effective solution to overcome linguistic and communication problems in those contexts where all learners speak both the languages used; nevertheless,

this may not always be the case of EMI classes which are usually characterized by the presence of local and international students and a certain linguistic diversity.

Communication and interaction play a major role in the digital environment for a successful learning process (Cicillini & Salusso, 2019). Although the literature on e-learning is wide, for the purposes of the present paper attention will be devoted on the barriers of communication and the different types of interaction identified in distance learning by Moore (1989).

## **Methodology and Research Questions**

This research focuses on the students' perceptions of the opportunities and challenges emerged during the unplanned shift from in-person to distance learning, identified as ERE (Bozkurt et al., 2020). Specifically, communication and interaction in the EMI degree programmes in "Medicine and Surgery" and "Nursing" are observed starting from the students' perspective.

The research questions this study seeks to answer are the following:

70. How do communication and interaction change in the shift from the face-to-face to the online modality in EMI degree programmes?
71. What lessons can we learn from the sudden shift of EMI courses onto digital platforms due to the coronavirus emergency?

In order to tackle these issues, data collection was conducted through two online questionnaires sent during the COVID-19 emergency; thus, the online modality we refer to is specifically the ERE. The questionnaires, which were drafted using Google forms and addressed to lecturers and students, were anonymous, written in English and sent to the lecturers' emails and shared in several Facebook university groups. The participants and universities identified for this research were students and lecturers of 14 EMI degree programmes. Data was collected from *Universitaly.it*, an institutional webpage where all the degree programmes in Italian and English are stored and made available by the Ministry of University and Research.

For the purposes of the study, the students' questionnaire only was taken into account and discussed. 102 students filled in the online questionnaire which was composed of 28 questions, both open-ended and close-ended using a five-point Likert scale. Both quantitative and qualitative data were observed and analysed. The qualitative analysis was carried out by using certain keywords such as *interaction*, *communication* and *English*; the students' profiles and comments were given a number from 1 to 102 in order to diversify the participants.

## **Findings and Discussion**

### ***Context of the study***

Both the degree programmes involved in this study have restricted admission procedures and a limited number of places for prospective students, which are regulated by national entry tests and rankings. They also have specific English language entry requirements which range from B1 to B2, according to the CEFR (Common European Framework of Reference for Languages) descriptors (Cicillini, forthcoming; Cicillini (bis), forthcoming). In addition, while “Medicine and Surgery” is a 6-year master degree programme, “Nursing” is a 3-year bachelor. In the academic year 2019/2020 in which this study takes place, while the first semester was offered in the face-to-face modality the second semester was almost entirely held online, through the ERE modality because of the coronavirus outbreak.

The EMI courses offered during the first semester were held in-person in campus and hospitals as in the previous academic years. Interaction took place mostly in person and in class with immediate feedback from both lecturers and students, through work groups and projects, while communication outside the classroom was facilitated by office hours, emails and institutional web pages. By contrast, in the second semester classes, which were initially offered in the face-to-face modality, were suddenly transformed into online courses. Under those circumstances, there was little time to plan, arrange and standardize lessons in the online modality. For this reason, different digital platforms were used to do live classes (synchronous mode) such as Zoom (41%), Microsoft Teams (20%) and WebEx (18%), which were sometimes uploaded to Moodle pages (22%) after the classes. Besides, other lecturers decided to offer asynchronous classes through pre-recorded videos and PowerPoint presentations. In both these modalities, interaction and communication became more difficult because of technical and organizational issues, especially in the asynchronous classes. As a consequence, most of the interaction and communication took place via digital channels: chats, emails and forums. Learners could communicate with their instructors writing questions in the chat boxes, sending emails or attending online office hours. Moreover, they had to interact with their classmates mostly using their mobile phones or social media as the lockdown rules hindered their usual group activities and study groups. Finally, some of them did not have their study books with them and could rely mostly on digital resources to access study contents. These circumstances have impacted on their learning strategies and challenged them from different points of view as is shown in the following paragraphs.

## **Communication**

As data referring to communication shows, the main issues of concern in students' perceptions are relating to the areas of human contact and the way information was managed.

### *Human contact*

Considering their answers on what they missed most about face-to-face classes, students stated they were affected by not seeing their classmates and lecturers. Concerning peer communication, they revealed they felt less motivated and had difficulties getting ready for the exams because they could not rely on their work group or teamwork activities (47%). Regarding communication, students lamented that it was difficult to reach out to them: even if they sent emails to their lecturers (60%), wrote questions in forums (20%) to ask for clarifications, used the chat box during online lessons (50%) and were able to ask for explanations (48%), they missed the immediate feedback they used to receive during face-to-face classes. Moreover, feeling more anxious about the exams they would have appreciated being reassured and emotionally supported by their lecturers. As data shows, during ERE, socio-emotional aspects were challenging and not always successfully handled. Not all students felt at ease during online classes: for example, 11% did not dare to ask questions because their class was being recorded. To sum up, this lack of communication increased their difficulties and affected their learning process: not being able to meet their lecturers in-person was not only a socioemotional issue. Students stated they missed the immediate feedback of face-to-face lessons, which allowed mutual understanding and made the explanations clearer. So, it seems necessary to devote more attention to the aspects connected to care, well-being and socioemotional issues by providing specific training to lecturers.

### *Information and courses organization*

Apart from the human factor, students lamented that they missed clear information about course timetables and exams, as the comment below shows:

*“Exam formats and instructions were not clear until just a few days before so it was difficult to prepare properly” (Student 4)*

The sudden shift to remote education caused some uncertainties concerning the way classes were taught: some lecturers chose to teach online live classes while others opted for pre-recorded presentations.

*“It is important all professors will use the same tools to record a lecture” (Student 88)*

In their comments, students underlined they could not always rely on clear guidelines and were confused by the fact that lecturers chose different ways to deliver their lessons and did not explain from the beginning of the lockdown how the assessment would be organised.

*“I'd prefer if professors formulated a schedule in the beginning and stuck to it rather than upload the lectures whenever they liked or all in one go. Some flexibility is allowed but not knowing when the next class will be makes it hard to plan my time” (Student 74)*

To sum up, human contact (learner–learner and learner–instructor) and clarity of information can implement the quality of distance learning; if implemented, these two elements could contribute to offering distance quality learning in possible future EMI courses.

### **Interaction**

The respondents complained about the quality of interaction and engagement in their EMI classes, especially when education had to suddenly switch to the online modality during the outbreak. They identified several obstacles to the effectiveness of interaction, which included the general low levels of English proficiency and digital expertise, the lectures mode and technical problems.

Overall, the majority of the respondents (91%) confirmed that English was the main language used by students and lecturers in both face-to-face and online EMI classes. Few students only argued that they occasionally switched to Italian to better express themselves, presumably the Italian ones. However, the low levels of English proficiency, both of students and lecturers, identified by the respondents as a major obstacle to interact in class is one of the biggest challenge of the EMI environment because it may hinder the quality of education and interaction. Although the entry requirements set to enrol in EMI degree programmes in “Medicine and Surgery” and “Nursing” range from B1 to B2, according to the CEFR (Common European Framework of Reference for Languages) (Cicillini, forthcoming; Cicillini (bis), forthcoming), some students complained about poor learner–instructor and learner–learner interaction. In their view, this was mainly due to low and different levels of English proficiency and confirmed by the fact that some were not able to express themselves correctly and fluently.

*“The lecturers spoke English poorly, and with strongly marked accents”  
(Student 2)*

*“My English is at a higher level compared to most of the people around me, both students and professors. I think my English might have even deteriorated” (Student 11)*

Others claimed that the quality of interaction worsened in the shift to the online emergency education mainly because of issues related to the digital modality. They complained about internet connection problems (72%) faced, technical problems (30%) and the lack of a personal device for studying (10%) which have undoubtedly made communication and interaction more difficult. In addition, they mentioned the loss of clear instructions and of a standardization of lessons among the disciplines taught. As a matter of fact, no common strategy was adopted to offer EMI lectures, as some lessons were offered through the live modality, occasionally recorded and uploaded in the lecturer's personal page, and others were encapsulated into pre-recorded PowerPoint presentations. The data shows that especially in the pre-recorded lessons, interaction was quite challenging because the only ways allowed were the use of forums (20%) and emails (60%). In the live sessions instead, the respondents argued that they sometimes used the chats (49%), with or without the lecturers' permission, but that they did not feel at ease to interrupt the lessons and ask for explanations and feedback. As a consequence, 66% of the students argued to have interacted with their classmates (learner-learner interaction) and asked them for help instead of interacting with the lecturers. Below, some comments given by the respondents:

*“Those that gave us the lessons were only a registration of slides with audio. Only two professors out of 10 had a live session for questions. Nothing was positive about it” (Student 13).*

*“I only had few live lessons with the professors. Mostly, study materials (ppt, documents, reference books) were posted in Moodle or in Google classroom” (Student 67).*

*“There was no interaction, just pre-recorded lectures” (Student 55).*

*“There was no interaction with both the lecturer and the classmates. The only interactions were via chat in both cases. One professor encouraged oral interactions during the lecture but the noise of everyone's mics interfered” (Student 98).*

To sum up, according to the respondents, both learner-learner and learner-instructor interaction in face-to-face classes is more meaningful and dynamic than in the online modality probably because they are more used to ask and receive feedback immediately and feel more comfortable with human interaction. Instead, the sudden shift to the digital

environment has proved to be very challenging, presumably because of the lack of time to design the courses in the online modality. This may have been also due to the students and lecturers' poor digital skills and the various technical problems faced during the outbreak. Instead, the problem of English proficiency still remains a big issue to address, both in face-to-face and future online classes. These findings suggest that in the students' perspective, interaction in EMI classes is an essential part of the course programme and consequently a detailed planning of the objectives and outcomes seems necessary to guarantee higher educational quality and encourage the implementation of future online EMI programmes throughout the country.

## **Conclusions**

This study has presented the results of a questionnaire addressed to students enrolled in the academic year 2019/2020 in EMI degree programmes in “Medicine and Surgery” and “Nursing” in Italy. Their perceptions, opinions and expectations have been investigated in order to explore how communication and interaction have changed from the face-to-face to the online modality during the pandemic (RQ1) and to identify possible best practices for future online EMI programmes (RQ2).

As regards RQ1, the sudden shift from the face-to-face to the online modality has been problematic for several reasons but mainly because the university community has had very little time to adapt to the new learning environments and needs. While communication and interaction have always been very challenging in face-to-face EMI contexts, they have exacerbated in the digital modality because of the inadequate proficiency for handling communication effectively through the medium of English, of low digital expertise and various technical problems.

Indeed, whereas in the face-to-face modality communication and interaction used to take place traditionally in class and in person through questions, debates and immediate feedback, new strategies and tools were introduced in the online modality during the outbreak. Although during the emergency the sudden introduction of certain digital platforms and tools soon became the only way to learn and keep in touch with professors and classmates, not all the stakeholders involved were able to use them efficiently. As a matter of fact, some respondents claimed that many lecturers and students did not know how to use certain digital tools and did not receive enough instructions to maximize their full potential. Therefore, digital training and support, together with clearer instructions, would be necessary in case of future EMI online programmes. Although ERE education has suddenly replaced the traditional education without notice, it has also provided new insights into interaction and communication in EMI online courses and how they could be improved in future learning environments. Regarding the RQ2 concerning the lessons

learned from the sudden transition from in-person EMI classes to ERE, four main aspects can be identified. First data shows the need for specific training on best practices to deal with communication and interaction. English proficiency is an issue of concern for EMI courses (both in-person and online) and according to the respondents more resources should be put in place to increase lecturers' and students' language skills. Apart from English proficiency and knowledge of EMI pedagogy, lecturers should rely on effective tools to implement interaction among students and be trained on how to use them successfully. For example, students could benefit from interacting in small groups in safe digital rooms, but on the one hand not all the platforms offer this option and, on the other hand, not all the lecturers are familiar with them. Second, this study has shown that the lack of clear and binding guidelines on how to teach lessons has impacted the quality of communication: that the standardization of the classes format should be a top priority in students' opinion. As a consequence, confusion can be minimized by adopting similar modes in the delivery of lessons. Third, students would like to have more opportunities to interact with their lecturers: more office hours could be useful, but they could increase the burden for lecturers. Peer tutoring with older students could help students to better understand the contents and to increase human contact and interaction. Finally, the quality of the interaction should be improved: some students lamented the difficulty of interacting during classes because of the background noise due to activated microphones. Although some lecturers encouraged students to unmute their microphones and speak their minds or voice their concern, they had to mute them because of the annoying echo. Faculties should invest in effective tools to promote interaction during classes, which could allow students to interact more.

To sum up, ERE has proved that EMI courses can be taught online; however, some key issues still need to be tackled to rely on effective interaction and communication in online EMI classes. Further research, training and investments can make the difference.

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## **SOCIAL PRESENCE AND EDUCATIONAL TECHNOLOGIES IN AN ONLINE DISTANCE COURSE IN FINNISH HIGHER EDUCATION – A SOCIAL CONSTRUCTIVIST PERSPECTIVE**

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### **Abstract**

This paper analyses the interplay of social presence and educational technology, from a social constructivist perspective, to question the current determinism prevailing in the literature. Taking an online distance course implemented in Finland as its case, the study reveals how students negotiate the way they share visual cues and personal background and experiences. Thereby, it critically examines the impetus to create more social presence through visual cues and personal information, by highlighting some of the ethical implications. Moreover, the study reveals that text-based online discussions occurring in forums provides more space for students to participate in discussions than webinars, despite being negatively perceived by students. The study also shows how students and instructors' practices have the potential to re-shape the way technologies are used in online distance education, to eventually reach more equity between students' and teachers' presences.

**Keywords:** Online distance course, educational technology, social constructivism, social presence

### **Introduction**

Online distance education, defined as a mode of instruction using online technologies to operate at a distance, considerably expanded in the last decades. It led to its massification and the emergence of new actors such as traditional on-campus universities (Kaplan & Haenlein, 2016; Griesbaum, 2017). These processes were exemplified and accelerated during the Covid19 pandemic. This brought new evidence of the need to re-think the way our social experiences of learning are transformed when moved online. In this vein, researchers analysed online social interactions and more specifically social presence, defined as the sense of being there with others in a mediated environment (Heeter, 1992). Social presence was seen as a mean to limit the feeling of isolation experienced by online students (Aragon, 2003). The strategies identified to promote social presence ranged from

the creation of personal profiles, the incorporation of audio and visual cues, the participation in and initiation of online discussions, or the share of personal experiences (ibid.). Undoubtedly, the general incentive for social presence in online learning was influenced by broader trends towards more self-disclosure on the internet, with potential ethical issues.

A review of the literature found that research on social presence and educational technologies was characterized by a lack of theorization and by deterministic views, often due to prevailing instrumental concerns. Conceptual confusion was visible in research on social presence, which was not clearly defined in many research pieces (Lowenthal & Snelson, 2017). Moreover, to address practical concerns, researchers examined what social presence did, in other words, its effect on learning, rather than what it was. More generally, deterministic accounts of social presence defined it as the extent to which the “illusion of direct experience was created” (Kehrwald, 2010; p.40). It then did not recognize that realities, whether online or not, were never “passively received and registered by social actors” (Mantovani & Riva, 1999; p.4). Other research works focused on the way students projected themselves as “authentic and unique person(s)” (Lowenthal & Snelson, 2017; p.149). Thereby, they disregarded that the way personal experiences and background information were shared varied from a context to another. On the contrary, according to the impression management theory, individuals “adjust(ed) their behavior in an ongoing dynamic relationship with other players” (Houtman, Makos, & Meacock, 2014; p.422).

As for technologies, their lack of theorization in the literature was regularly outlined by some authors (Jones & Czerniewicz, 2011; Issroff & Scanlon, 2002; Bennett & Oliver, 2011; Phillips, Kennedy, & McNaught, 2012). For instance, many empirical research did not refer to any theory (Hew et al., 2019; Bulfin et al., 2013). This was because the literature was geared towards instrumental rather than theoretical purposes. Many research pieces aimed to improve online practices (Phillips Kennedy & McNaught, 2012; Bennett & Oliver, 2011). Others evaluated online distance education before closely examining what it was (Luppacin & Lin, 2012). Moreover, many research works implicitly reproduced positivistic, essentialist and realistic perspectives (Oliver, 2013; Hamilton & Friesen, 2013). They considered technology as an “autonomous force beyond social agency” (Batteau & Jazayeri, 2018; p.2).

This paper presents some of the results from the author’s thesis, submitted in August 2020, as part of the master’s degree on international and comparative education, at Stockholm University. The thesis offered an alternative to the way social presence and educational technologies were traditionally considered in the literature, by applying a social constructivist lens. According to social constructivism, social realities did not exist outside

individuals' continuous interpretation and were shaped by interactions with others as well as historical and cultural norms (Creswell & Poth, 2007). It followed that individuals had the agency to shape educational technologies and social presence, but they were constrained by the environment, including its materiality because the distribution of agency varied in different learning situations. The study aimed to analyse how social presence was performed and negotiated by students and instructors through their uses of educational technologies. The study was guided by the following research question: how was social presence socially constructed through technologies across different online learning activities by instructors and students in an online distance course? To answer it, the study followed a case-study design, taking as a case an online distance course designed and implemented by the University of Oulu, Finland, and a network of Finnish universities (UniPID). The course in English was offered to international, national and exchange students enrolled in one of the network's universities. Students were encouraged to critically examine global education development and its post- / de-colonial implications. The course took place on Moodle, a learning management system and used other technologies, such as Zoom, a web-conferencing software. The course comprised of individual learning activities along with online text-based discussions in Moodle forums and webinars, on Zoom, among others. After introducing the rationale of the study, the presentation will now move to defining the methodology of the research. The results will be later presented and discussed.

## **Methods**

This research project pursued a comparative qualitative research strategy with basic descriptive statistics, thus introducing elements of mixed-methods. It focused on the analysis of one case, informed by multiple data sources. The course was chosen because it was running for the first time, turning this research into an opportunity to reflect on its implementation. Besides, the Finnish context was interesting for being representative of current international trends in higher education. In particular, this course exemplified the ongoing efforts to internationalize the Finnish higher education system in the last decades (Haapakoski & Stein, 2018). On the other hand, the Finnish context is characterized by a certain uniqueness: Finland now benefits from remarkable internet infrastructures (OECD, 2017; McGrath & Åkerfeldt, 2019). It explains why most of the study participants were using electronic devices for educational purposes on a daily basis, according to survey questionnaires. Besides, in its current policies, the country partly contrasts with the ongoing marketization and corporatization in higher education, as it partly taps on the welfare state model (Ursin, 2019). In addition, the study had comparative elements: social presence was compared across different online learning activities that occurred during the

course. The qualitative comparative method elaborated by Palmberger and Gingrich (2014) was used.

Twenty-one students agreed to participate in the research project and signed a consent form, out of the sixty-five students enrolled in the course. Multiple data sources were collected, including observations of interactions and learning activities, survey questionnaires, students' learning diaries, course material, and six semi-structured interviews with students. Observations were the main data sources and provided insights on the interactions that occurred during specific learning activities, such as the forum discussions or the webinars. Observations were completed with interviews and students' learning diaries, to shed light on students' perceptions. Survey questionnaires and course materials were also used to contextualize the study, in particular its population and its pedagogy. The data was analysed using content and interaction analysis as well as basic descriptive statistics. Quality was ensured using Tracy's (2010) eight criteria for qualitative research and the study complied with procedural ethics, in particular, the Swedish Good Research Practices (Vetenskapsrådet, 2017) and the Finnish Ethical principles of research with human participants and ethical review in the human sciences in Finland (TENK, 2019).

## **Results**

In the study, social presence was addressed in its multiple dimensions. In particular, the results enlightened three aspects of social presence: the extent and the way (a) personal background information and experiences and (b) sensory inputs were shared and interpreted, as well as (c) one demonstrated and interpreted active presence through participation.

To begin with, in the literature, sharing personal background information and experiences was often seen as beneficial to social presence. Following this principle, in an introductory activity, students were asked to introduce themselves to the group in a discussion forum. The comparison of their introduction showed that participants emphasized their institutional belonging and their educational experiences, rather than other aspects of their identity. They were influenced by the academic norms embedded in the learning context and manifested in the activity's instructions. Also, the way participants introduced themselves was shaped by group dynamics, as noted by an interviewee: "I think, we did it in the introductory part, we discussed ourselves, we put pictures of ourselves. And to be honest, this is because somebody did it at the beginning and I am pretty sure then everybody started to copy because this is a social thing" (extract from the interviews). Those dynamics explained the homogeneity found in students' introductions. Students could read others' posts and be thus influenced by them. However, some participants'

introductions stood out from the group because they were shaped by specific subjective and culturally situated meanings. For instance, only one participant referred to personal experiences and provided gender-related information: “I use they/them pronouns” (extract from the introductory activity). This participant also mentioned being familiar with gender studies, which explained a higher sensitivity to this issue. Consequently, the findings demonstrated that participants did not freely project their selves in the group. Social presence in this activity was a negotiation between culturally-situated and subjective meanings, interactions with others and academic norms.

Secondly, sharing visual cues was often praised for increasing social presence. In the course, along with their introductions, students could publish “a picture of themselves or of something that represents themselves” (extract from the course materials). Comparing these pictures enabled to highlight that the medium, here the photograph, did not determine participants’ social presence. The majority of students shared a picture in which they were easily identifiable, such as selfies. Yet, in four cases, several individuals were represented in the photographs, making it harder to identify the participants. One picture particularly stood out because it purposively maintained anonymity: “I choose to not appear in photographs. Instead, I chose some picture cards from my material stash” (extract from the introductory activity). Interestingly, the same participant indicated “I prefer not to say” to the question about gender, in the survey questionnaire. In the picture that was published, the social presence displayed, defined here as subjectivity, did not present any unity. It was a composition of four photographs, representing various individuals and conveying different narratives. Therefore, the analysis of the photographs published in the course highlighted that, despite the current impetus to produce identifiable representations, exemplified by selfies and social network practices, students differently negotiated the degree of visual cues they want to share in the photographs.

Thirdly, the study compared students’ and instructors’ presence in online text-based discussions, occurring in forums, and during webinars organized through Zoom. The findings indicated that technologies were not the only determinant of the way students and instructors participated and shared of sensory inputs. In forum discussions, students’ presence, understood as participation, was higher than instructors’ presences, although it fluctuated. However, several interviewees negatively reflected on discussion boards and students progressively disengaged with them. Interviewees mentioned that they failed at reproducing real discussions. However, no consensus existed between interviewees on what a real discussion was. Similarly, observations revealed that students’ uses of forum discussions differed: some took it as a space for discussions, others as a space to publish their individual essay. There was no group consensus on what a legitimate use was. This explained why students progressively disengaged with the activity. Another element

explained the already mentioned disengagement and shed lights on the risks when students' and instructors' participation was unbalanced. Forums tended to shift the workload from instructors to students, as the later became the main drivers of the discussion. Despite being an efficient solution to decrease academic workload, it could create an unequal repartition, to which students could react by disengaging in the discussions.

In webinars, instructors' presences prevailed. They drove the discussion occurring through video and were the main ones to appear in the camera. On the contrary, students were reluctant in participating in the main discussion. They took over the chat functionalities as an alternative way to participate, despite instructors' efforts to engage them in the discussion through video. It was due to material constraints as Zoom gave stage on the screen to one participant at a time, that was the prevalent voice and sound. It thus emphasized the speaker. This technological feature may have intimidated students. Besides, the space left to participate in the discussion was smaller in webinars, compared to discussion forums. As a consequence, although Zoom provided more sensory inputs in theory, in practice, it did not distribute them equally but based on existing academic hierarchies that favoured instructors. To summarize, text-based online discussions provided more space for students to participate in the learning activities, while webinars favoured instructors' presence.

## **Discussion**

The analysis of participants' introductions was in line with research on the social construction of identity and the theory of impression management. Self-representations varied from a context to another, through the influence of social interactions and norms embedded in specific contexts. However, this study showed how, in the context of low social presence, such as the introductory activity in which students interacted for the first time, students tended to produce presentations of themselves, in compliance with academic norms, to avoid standing out.

In the photographs posted for the introductory activity, students negotiated their degree of visibility and identifiability. The anonymity provided by the online environment opened up possibilities for deconstructed representations of the self. This finding was in line with research showing how anonymity in online learning environments could encourage re-embodiments (Belk, 2016) or set conditions for students to filter out some information by reducing the share of visual cues (Öztok, 2013). However, the analysis of photographs also showed that they were broadly used as conveyers of visual cues. It revealed the influence of widely spread practices of image sharing on social networking sites (Zappavigna, 2016). Nowadays, space for a blurred and ambiguous identity to be displayed on the internet is

increasingly reduced (Floridi, 2012, as cited in Belk, 2013; p.487). Individuals are more and more encouraged to share visual cues and information to identify them. Throughout the introductory activity, it was exemplified in the way most photographs represented participants as the focus of the photographs, in clearly identifiable ways, often in the form of portraits or selfies. Attempts to augment visual cues raised ethical issues as it emphasized visual cues as the main determinant for social presence, with risks of conveying prejudices.

The findings questioned the belief that video-conferencing tools created more direct experience, compared to forums by showing that in both cases, social presence was negotiated. Online forums gave more space for students' presence, while webinars favoured instructors' presence. This fact is illuminating by those technologies' genesis. Online forums were originally compared to a virtual agora as they opened up a space of democratization (Street & Wright, 2007; Papacharissi, 2002). On the contrary, Zoom was first produced for business meetings. The way it distributed participants' presences was more unequal. Yet, the study showed that students negatively appraised forum discussions. Students' ways of participating in webinars tended to reproduce academic hierarchies. This corroborated with students' tendencies to endorse conventional learning habitus (Costa et al., 2018). Even if technologies and pedagogies can open avenues for emancipatory learning practices, they are not the main determinant of students' practices. The latter are strongly influenced by academic traditions that provide a stable framework in which students are familiar to navigate. For alternative uses to emerge, instructors and students need to learn how tools can be utilized and agree on the way they should be used. In addition, alternative uses also occur within the limits of material and structural constraints. The two technologies compared in this study, Zoom and Moodle, differ in terms of flexibility. Moodle, for instance is open source and more adaptable. However, configuring it requires time and expertise, two elements that can contradict the imperative of efficiency and the industrialization of educational technologies, that are at the core of current trends in online distance education. Finally, encouraging students' to demonstrate active social presence should be critically reflected upon. It could overburden students, and could even become a tool for surveillance and control. Signalling one's presence could be used by instructors to track participation (ibid.). This could be made even more problematic if it occurs along with a dis-balanced participation between students and instructors.

## **Conclusion**

To conclude, this study helped to understand how using technologies and inhabiting the online space could reshape social relations and learning processes. In this case, students' and instructors' social presences were reconfigured when moved online. However, the



analysis also revealed how academic norms and hierarchies were sustained, even by students themselves, especially when no consensus existed on the way technologies should be used. Developing and agreeing on what kinds of shared digital competences is required could be a way of building this consensus. In addition, this study highlighted some of the ethical implications when encouraging students to increase their social presence: from risks associated with online self-disclosures to the ones linked to inequitable and unbalanced presences between instructors and students.

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## MONOCHRONIC VS. POLYCHRONIC: A PROFILE OF ACADEMIC TIME USE AMONG ONLINE DISTANCE EDUCATION STUDENTS

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### Abstract

The results presented are part of a doctoral thesis which is being finalized. The research is centred on the online distance learning student experience in higher education, considering the variable time management, its relationship with technologies, and the virtualization of teaching and learning. Exploratory in nature, the research takes the form of a case study using a mixed methodology. One of the main objectives of the study is to contribute to the construction of a theoretical framework on the distance learning student time variable. We present a profile of academic time use by e-students (monochronic or polychronic) and suggest an intermediate profile. The conclusions point out that the profile of academic time use varies according to the degree of the course attended. It was found that undergraduate students show a more polychronic profile than masters and doctoral students.

**Keywords:** distance education students, virtual time, monochronicity, polychronicity

### Introduction

In the traditional university (face-to-face), students are expected to arrive at the classroom at the indicated time and occupy a place in the physical space. There is a predetermined time for teaching and there is generally a tolerance for delays, after which time the student is often prevented from entering. This is the experience of chronological time in Western societies in general. The internet appears as a disruptive technology. Studying online in distance learning settings means living in a new dimension, a new way of inhabiting time and space. The virtual time that results from the digitalization of societies is, at the same time, ephemeral, synchronous and asynchronous, present and future (Duncheon & Tierney, 2013); it is timeless time, without sequence, undifferentiated and eternal (Castells, 2005). Virtual reality represents the clearest example of disruption, insofar as it allows us to simulate and evaluate the consequences of a particular action in a time that does not yet

exist, enabling the correction of a predictable reality, tested in the virtual dimension (Lee & Whitney, 2002).

With regard to online distance education, Ducheon and Tierney, interviewed by Cottier and Lanéelle (2016) identify changes inflicted by virtual time: the limits of space and time have disappeared – learning takes place in a virtual class, where colleagues, teachers and content are potentially available anytime, anywhere; time flexibility has been expanded – activities and schedules can be organized according to individual availability and asynchrony favours international classes and classes in which geography and time zones are not limitations; the pace is faster and multitasking is favoured.

### **Online Academic Time**

In an increasingly fast-paced society, time is a capital resource and a critical success factor, so much so that the skills related to the ability to manage time are already considered key competences of the 21<sup>st</sup> century (Langa, 2013). Time is a unidirectional and irreversible resource; it cannot be stored for consumption in periods of grace. When time is not well managed, it is lost and cannot be replaced (Langa, 2013). In other words, time is the only resource that runs out doing absolutely nothing.

Despite all the changes stimulated by technologies, most organizations continue to govern themselves with chronological time as their reference point. The distance students are faced with the need to change their view between contexts, depending on whether they are working in a chronological logic of organization or in a logic of virtual organization (Ducheon & Tierney in Cottier & Lanéelle, 2016). For example, when the distance students have a certain deadline to meet, they are faced with a chronological logic of organization. However, when faced with an asynchronous activity that will be performed in a team, they may have to organize themselves according to a logic of virtual organization in negotiation with their colleagues.

Difficulties in time management are one of the main regrets of online distance learning students, who report struggling with too many tasks related to their academic life and which they have difficulty reconciling with family support and professional activities (Sánchez-Elvira Panigua & González Brignardello, 2014). Several studies indicate that distance students show a high deficit of organization and planning of their time, which leads to great anxiety and stress in the period before the assessment tests (Langa, 2013; MacCann, Forgarty, & Roberts, 2012; Sánchez-Elvira Panigua & González Brignardello, 2014) and can result in withdrawal and retention. However, time management skills are not independent of personality and, as such, can be trained, a need that is increasingly pressing as teaching virtualization grows (MacCann, Forgarty, & Roberts, 2012; Nadinloyi

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et al., 2013). Reinforcing this position, the recent studies by Heo and Han (2018) point to a negative correlation between the high stress levels of online students and the predisposition for autonomous and self-directed learning.

Although the difficulties of time management are identified in all students, women perceive and use time in a different way when compared to men. Often it is women who most indicate that academic responsibilities take them away from family and childcare, often feeling guilty for the time they are no longer able to devote to the family (Stone & O'Shea, 2013; 2019).

## ***The Use of Time: Monochronic and Polychronic***

The way we perceive time, the way we organize our agendas and set priorities is closely linked to the context in which we were born and educated (Hall, 1959; Hall & Hall, 1990). Hence, the tendency for Northern Europeans, for example, to have a more monochronic profile than Africans, Arabs or Latin Americans (Fulmer et al., 2014).

Table 1: Characteristics of monochronic and polychronic people

Monochronic individuals	Polychronic individuals
Do one thing at a time	Do many things at once
Concentrate on the job	Are highly distractible and subject to interruptions
Take time commitments (deadlines, schedules) seriously	Consider time commitments an objective to be achieved, if possible
Are low-context and need information	Are high-context and already have information
Are committed to the job	Are committed to people and human relationships
Adhere religiously to plans	Change plans often and easily
Are concerned about not disturbing others, follow rules of privacy and consideration	Are more concerned with those who are closely related (family, friends, close business associates) than with privacy
Show great respect for private property, seldom borrow or lend	Borrow or lend things often and easily
Emphasize promptness	Base promptness on the relationship
Are accustomed to short-term relationships	Have strong tendency to build lifetime relationships

Based on Hall and Hall (1990, pp.15)

Although we cannot talk about people who are totally monochronic or totally polychronic, we can talk about profiles of time use that tend to be either monochronic or polychronic (Kaufman, Lane, & Lindquist, 1991). People who prefer a more monochronic use of time tend to do one task at a time, applying a high level of concentration to the development of the task, have difficulties in managing interruptions, and stick to their plans and schedules scrupulously. On the other hand, people who make use of time in a polychronic way are able to perform several tasks simultaneously and have no difficulty in changing their plans and agendas if necessary. The studies by Kaufman, Lane, and Lindquist (1991) conclude that there is no direct relationship between a more polychronic use of time and the variables age, sex, marital status or income. However, the authors conclude that individuals with higher levels of education and those who work more than 40 hours a week, as well as individuals who are linked to associative activities, tend to make a more polychronic use of time.

However, in view of the emergence of the virtual time dimension, several authors have been exploring the perception, use and management of time in the online space by online distance learners (Barberà & Reimann, 2013; Capdeferro, Romero & Barberà; 2014; Stone & O'Shea, 2019). Studies indicate that women who attend online courses have a more polychronic profile in terms of the use of time (Stone & O'Shea, 2019). In the authors' opinion, the greater burden of responsibilities in terms of family management that has to be reconciled with professional and academic responsibilities is decisive in the use of more polychronic time and in multitasking (for example, cooking while studying).

Assuming the definitions of monochrony and polychrony proposed by Bluedorn, Kaufman, and Lane (1992), Hall (1959), Hall and Hall (1990), Kaufman and Lane (1992) and Kaufman, Lane, and Lindquist (1991), and adapting them to the context of the online student, we understand that a student who has the ability to perform various tasks at the same time (for example, typing on the computer while talking on the phone or watching a videoconference), and who values interpersonal relationships and interaction with classmates more, to the detriment of strict compliance with the temporal and timed order of an agenda or commitment, will tend to have a more polychronic profile. On the other hand, students who tend to be monochronic have an extremely organized attitude, plan their commitments in advance and focus on performing one task at a time, tending not to deepen affective relationships with colleagues or the class as a whole. An online distance student with these characteristics tends to prefer a well-structured activity calendar with a defined time allocated to each task (Capdeferro, Romero, & Barberà; 2014). In this context, there is a high probability that a monochronic student will experience difficulties in adapting to a poorly structured course, of a socio-constructivist nature, and controlled by the student. Likewise, students from a predominantly monochronic social and cultural reality may find it difficult to adapt to eLearning (Martinak, 2012). The flexibility of time, pace and place, which could be considered an asset, if not well managed, can degenerate into procrastination and, ultimately, lead to drop out. Therefore, a good student reception system, the support of peers and the guidance of teachers and tutors are essential (Barberà & Reimann, 2013; Capdeferro, Romero, & Barberà, 2014; Carreras & Valax, 2010; Miertschin, Goodson, & Stewart, 2015).

## **Methodological Approach**

Our research has an exploratory nature and takes the form of a case study which uses a mixed methodology of data collection and analysis. The participants in the study are online distance students at the Portuguese distance learning university which pedagogical model is based in asynchrony (Pereira et al., 2008). We resort to document analysis, collection and



analysis of online distance students' narratives, surveys and interviews, using intermethod triangulation based on qualitative and quantitative methods.

The survey was designed according to the research objectives and questions, taking into account the categories arising from the literature review, document analysis and analysis of the narratives. Aware of the importance of retaining respondents, we opted for the construction of a survey consisting of closed questions and alternative answers classified on a Likert scale of frequency or agreement. The question order was also designed with the aim of avoiding tiredness and maintaining the respondents' interest, avoiding a mounting effort curve. Ethical issues were assessed and ensured by the Ethics Committee of LE@D (Laboratory of Distance Education and eLearning), the research centre that hosted the present investigation, and the survey was validated by statistical experts.

For the treatment and statistical analysis, we used the SPSS software, version 25. In the treatment of the data presented in this article, the following procedures and statistical tests were performed: adjustment test, to test the proportion of the sample in relation to the universe; Pearson's Chi-Square test ( $\chi^2$ ); and Cronbach's alpha coefficient.

## **Results**

### ***Sample characterization***

The data collected in the survey allows us to present the general profile of the distance students in our sample (N = 212): 55.7% of the respondents are women and 44.3% are men; the most represented age group is 41-50 (41%) and the average age is 43.2. 64.6% of respondents have dependent children or adults. As for nationality, 87.7% are Portuguese, followed by Brazilians (6.6%), Cape Verdeans (2.4%) and Mozambicans (1.9%). Other nationalities represent less than 1% of the sample. Portugal is the country of residence of 78.8% of respondents. In spite of a high percentage of students who have a professional activity (93.9%), 66.5% of respondents attend higher education full time. As for the degree attended, 55.2% are undergraduate students, 37.7% Master's students, and 7.1% PhD students.

The sample is representative of the public at a mature age who seek to realize in the online university the opportunities they have not had in the past due to professional, financial or family options. The most expressive data of this reality are the 39.3% of students who enrolled in an online degree via the skills recognition program for people over 23. In addition, 25.6% of the students entered due to a change of institution or course, and 20.5% entered after completing 12 years of schooling, often after dozens of years without studying.

**Monochronic vs. Polychronic: A Profile of Academic Time use Among Online Distance Education Students*****Profile of online distance students' time use: monochronic or polychronic?***

In order to verify the profile of academic time use of the students in our sample, we defined 13 items in the survey whose scores would allow us to assess a more monochronic or a more polychronic profile, considering a Likert scale of five levels. Calculating the Cronbach's Alpha coefficient, a good internal consistency was found among the 13 items (Cronbach's Alpha = 0.849) (Table 2).

Table 2: Cronbach's Alpha coefficient – Time Use Profile: Monochronic or Polychronic

	Scale Mean if item Deleted	Scale Variance if item Deleted	Corrected item total Correlation	Cronbach's Alpha if item Deleted
14.4. The online course helps my self-discipline	40,50	74,772	,367	,846
15.4. I follow my schedule strictly	41,33	72,402	,496	,839
15.6. I focus on a task at a time	41,13	74,292	,333	,848
15.7. I do the academic tasks according to what is defined in the curricular units schedule	40,84	70,676	,543	,835
15.8. Whenever I can, I use my daily commute (to and from work, for example) to study.	42,02	69,336	,411	,847
16.1. I plan my tasks daily.	41,42	68,310	,551	,835
16.2. I plan my tasks weekly.	41,10	67,066	,633	,829
16.3. I plan my tasks monthly.	41,62	69,374	,488	,839
16.4. I differentiate between urgent and important tasks.	40,45	70,571	,604	,832
16.5. I easily refuse leisure activities if they interfere with my academic plans.	40,88	70,080	,579	,833
16.6. I opt for the dedication to academic work instead of hobbies, social life or leisure.	40,94	69,191	,618	,831
16.7. I access the curricular units in the online platform daily.	40,68	71,527	,446	,842
16.8. I plan my off days to recover what I haven't managed to do during my working days.	40,58	69,979	,538	,836
N = 212				
Nº itens: 13			Cronbach's Alpha = 0,849	

Observing and analysing the variation in responses, we found that 25% of the respondents rated the 13 items at the lowest levels, between 1.46 and 2.92, and these are the students we can consider to have a more pronounced polychronic time use profile. On the other hand, the students who classified the items between the values 3.98 and 4.92 are those with a more monochronic time use profile (Table 3).

Table 3: Extremes and Quartiles Diagram – Time Use Profile: Monochronic or Polychronic

		Percentiles						
		5	10	25	50	75	90	95
Weighted Average	monochronic / polychronic	2,2808	2,5385	2,9231	3,4231	3,9808	4,3077	4,4615
Tukey's Hinges	monochronic / polychronic			2,9231	3,4231	3,9615		

Considering that there are no people who always behave in a polychronic or in a monochronic way in all situations (Kaufman, Lane, & Lindquist, 1991), we have surpassed a purely interpretative view of the data and considered an intermediate profile between the monochronic and the polychronic styles. Thus, students with a mixed or intermediate profile are those who rate items between 2.92 and 3.98. At the extremes, we considered the profile to be more pronounced: below 2.92 students with a tendency for a monochronic use of time and above 3.98 students with a tendency for a polychronic use of time. Checking

### Monochronic vs. Polychronic: A Profile of Academic Time use Among Online Distance Education Students

the percentages recorded in each of the styles (monochronic, intermediate and polychronic), we conclude that the highest average is obtained by the intermediate profile recorded in 47.2% of the sample. The remaining 52.8% are distributed by the monochronic (27.8%) and the polychronic (25%) profiles (Table 4).

Table 4: Time use profile: Monochronic or Polychronic

	Frequency	Valid %	Cumulative %
Polychronic	59	27,8	27,8
Intermediate	100	47,2	75,0
Monochronic	53	25,0	100,0
Total	212	100,0	100,0

Our research results allowed us to conclude that the time use profile varies according to the degree of the course that students take ( $\chi^2_{(4)} = 9.821$ ;  $p = 0.042$ ). Undergraduate students are those who show a more polychronic time use profile (34.2%) compared to master students (23.8%). PhD students are the ones who most show an intermediate profile between monochrony and polychrony (66.7%), and none of them obtained answers associated with polychronic behaviours regarding the use of academic time (Table 5).

When we cross the time use variables with the gender variable, we find that men (30.9%) tend to be more polychronic in terms of academic activities than women (25.4%); however, the observed differences are not significant ( $\chi^2_{(2)} = 2.214$ ;  $p = 0.339$ ) (Table 6).

Table 5: Course | Time use profile: Monochronic or Polychronic

		Polychronic	Intermediate	Monochronic	Total
Course Type	Graduation	fr 40	53	24	117
		% Course type 34,2%	45,3%	20,5%	100,0%
	Master	fr 19	37	24	80
		% Course type 23,8%	46,3%	30,0%	100,0%
	PhD	fr 0	10	5	15
		% Course type 0,0%	66,7%	33,3%	100,0%
Total		fr 59	100	53	212
		% Course type 27,8%	47,2%	25,0%	100,0%

Pearson Chi-Square  $\chi^2_{(4)} = 9.821$ ;  $p = 0.042$

Table 6: Sex/Gender | Time use profile: Monochronic or Polychronic

		Polychronic	Intermediate	Monochronic	Total
Gender	Female	fr 30	54	34	118
		% 25,4%	45,8%	28,8%	100,0%
	Male	fr 29	46	19	94
		% 30,9%	48,9%	20,2%	100,0%
	Total	fr 59	100	53	212
		% 27,8%	47,2%	25,0%	100,0%

Pearson Chi-Square  $\chi^2_{(2)} = 2.214$ ;  $p = 0.339$

Considering that no significant differences were found in the use of time between men and women, our results are in agreement with the studies by Kaufman, Lane, and Lindquist (1991), who did not find an unequivocal relationship between the sex variables and a more polychronic profile. Still, we highlight the recent studies by Stone and O'Shea (2019),

which point to a more polychronic profile among women who study online. According to the authors, this trend arises as a result of a greater burden of domestic chores and family care among women, which requires a greater management effort to reconcile family, work and university.

## Summary and Conclusions

The data indicate that undergraduate distance students tend to place less value on the temporal order of online course activities by committing themselves to several tasks at the same time, as opposed to master and doctoral students who tend to prefer more structured activities, with a time frame allocated to each of them.

The trend towards personalization of learning environments, virtualization and the internationalization of universities, which has been stimulated in the past decade, was unexpectedly and globally precipitated with the advent of Covid-19. The current reality justifies more than ever the development of research with the purpose of creating an evaluation scale of the profile of academic time use exclusively for online distance learning students, as well as understanding which profiles of time use are best adapt to the demands of teaching and learning online.

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