athena

# Athena State of Art in Digital Education

Project Athena - University Goes Digital for a Global Sustainable Education

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# Executive Summary

## BACKGROUND AND PURPOSE

The purpose of the Project University Goes Digital is to improve digital skills of University teachers, to reinforce their capacity to respond to the challenges Universities are facing during the COVID-19 pandemic or will face in future similar challenges. With active involvement of the lecturers and students from the beginning of the project, ATHENA will create, test and implement innovative digital practices, putting technologies in use to create new pedagogical approaches and achieve better learning and teaching experiences. The project seeks to foster cooperative learning environments, making them transformative and inclusive through the effective adoption of new technologies, such as e-learning, gaming platforms, virtual and augmented reality, systematically modelled to activate key competencies in digital learning. The project will create templates that lecturers can adopt and adapt to their classes, using different pedagogical approaches. It will be a toolkit that includes ebooks, videos, games, quizzes, AR and AI.

**RESULTS**

O1 - a multi-regional Platform Digital Learning Live HUB for Lecturers (eLEARN-HUB) to support lecturers to implement online/e-Learning courses. The eLEARN-HUB wil have: 1) a Pedagogic Model of Digital Learning, with course learning design (learning outcomes, syllabus, schedule, teaching methodology, assessment, academic resources, technological tools); and 2) a Prototype of Digital Learning Solution.

O2 – a Universal Toolkit for Digital Learning, to be used and tailor made by lecturers form all the scientific areas.

O3 – O6 – four online courses: Technology in Architecture, Organization and Leadership, Logistics and Research Methodology. The 4 Courses will be tested with pilot groups of professors and students, with active online participation of teachers from non-European Countries (Cape Vert, Brazil, Tunisia). The final version of the courses will be implemented in training events with lecturers from the 4 partners. In the testing phase, using pilot courses and

staff training events, Lecturers of the 4 Universities of the project will be given the skills to develop digital tailor-made courses for their students, using: GBL VR/AR, video classes, and AI systems.

For Intellectual Output 1 three main themes made explicit in the Athena Digital Learning Pedagogical Model; Athena Design Thinking methodology; Athena Pedagogical Model have been defined as worth investigating in the research phase and to be implemented along the project.

Those themes are all related to digital learning and inspired by the Digital Education Readiness program of the European Commission.

**Theme 1: Digital Learning State of Art**
***Digital learning literature review and Experiences from the field***

**Theme 2: Athena Design Thinking for Digital Learning Field Diagnosis**
***Towards students-centred systems***
***Towards an effective Digital Education Technological Solution***

**Theme 3: Athena Digital Pedagogical Model**
***Towards a relevant digital educational provision***

This report is regarding Theme 1 and the goal is to present the state of art of digital education in a theoretical perspective based on the research agenda in scientific terms, and in a practical perspective, presenting the results of digital education experience of the partners of the project.

# DIGITAL LEARNING LITERATURE REVIEW

## 1.1 Introduction

In a digital world, the possibilities of increasingly interactive resources have revolutionized the way people communicate and share knowledge through innovative technologies. Communication-related technology adds access to knowledge, which has been expanded through digital communication networks (Machado et al., 2019). The countless paths taken by innovation made possible by technology point to different realities and orientations in the communication process from social media. One of the main requirements for 21st century education is to make use of communication and information technologies in learning contexts supported by mobile technologies, applications for tablets and smartphones becoming increasingly popular among people (Sousa & Rocha, 2020).

This learning, which is called digital, is every learning activity that uses, in a significant way, information and communication technologies (Sousa & Sousa, 2019). It is interactive learning in which learning content is available online, that is, being digitally literate, which means the ability to access digital media and ICT, to understand and critically assess different aspects of digital media and media content, and to communicate effectively in a variety of contexts. There are numerous benefits for the learning process with the use of ICT in face-to-face classes, one of which is using open education platforms in a complementary way to improve students' academic results (Sousa & Rocha, 2018). Collaborative learning on these platforms that are called digital learning environments has encouraging effects in increasing knowledge, competence, satisfaction and problem-solving skills (Männistö, et al, 2020).

Digital learning and the use of learning environments heralds a new era in higher education (Virtanen, et al., 2018). In this digital context, transformation technologies happen at the speed of megabytes with digital resources that advance the cultural structure, especially about social relations, man vs. man, man vs. machine. Thus, the practices of using technologies for digital culture permeate knowledge that is manifested in a network and that, in higher education institutions, are interceded by the teacher, assuming this important role in education.
In this context, the present work is organized as follows: the next topic presents the method used in the study and the results. Finally, the final reflections of the work are contained.

## 1.2 Methodology

To increase knowledge, measure, and analyse scientific literature publications on trust in the field of digital education, bibliometric analysis was performed from a search in Clarivate Analytics' Scopus and Web of Science (WoS) database. The study was developed using a strategy composed of three phases: execution plan, data collection, and bibliometric. To assess the results in a more in-depth way for the bibliometric analysis, this result was exported to a bibliographic management software called EndNoteWeb. These data provided the organization of relevant information in a bibliometric analysis, such as temporal distribution;

leading authors, institutions, and countries; type of publication in the area; key words and the most referenced works [1] (Morris & Van der Veer Martens, 2008).
Scientific mapping allows investigating and mapping a global image of scientific knowledge from a statistical perspective. It mainly uses the three structures of knowledge to present the structural and dynamic aspects of scientific research (Sweileh, et al., 2017). Therefore, the main research questions of bibliometric analysis are:
RQ1: Which are the main technologies for digital higher education?
RQ2: Which are the main digital education practices and contexts?

### 1.2.1 Data collection and research strategy

Considering research problems: Which are the main technologies for digital higher education? Which are the main digital education practices and contexts? it was delimited, still in the planning phase, the search terms, i.e. "digital technology*" and "digital learning" and "higher education". The use of the truncator (*) occurred intending to potentiate the result by seeking technologies and their written variations presented in the literature. And, as a basic principle for the search, we chose to plan to search for the use of the terms in the "title, abstract and keyword" fields, without delimiting temporal, language, or other restrictions that may limit the result.

## 1.3 Results

From the research planning, data collection retrieved a total of 28 documents both in the Scopus database and in the Web of Science database. Eligible articles in the Scopus database were published between 2001 and 2021. In the web of science database, it was from 2014 to 2021. In the Scopus database, we observed that the highest productivity was in 2018 and 2020, with a total of 6 documents in each of the years 2002 to 2010 that there was no publication in the area and the lowest productivity between 2015, 2017 and 2018 that there were no publications.
In the web of science database, the highest productivity was in 2019 with 8 publications and the year 2020 with 7 publications in the area and the lowest productivity in 2014, with one publication in the area.
The first publication in the Scopus database was in 2001, entitled DISA: Insights of an African model for digital library development (Peters & Pickover, 2001), while in the web of science database it was in 2014 entitled Transformative higher education teaching and learning: Using social media in a team-based learning environment (Rasiah, 2014).
Of the 28 publications in the Scopus database in the web database of Science, there is a varied list of authors, institutions and countries that stand out in research on digital learning technologies in higher education.

When analysing the country that published the most in the area, it can be seen that Australia stands out in the Scopus database and in the web of science database, with an average of 19% of all publications, a total of 6 in the first base and in the second, it stands out with 14% of the works, a total of 4 publications in total. In second place, with 6% of the works are found China, Ireland, Romania, Russian Federation, South Africa, the United States, that is, with two documents each of these countries in the Scopus database. In the web of Science database

[1] Software-based on the *web* that contributes to the work of the researcher during the writing process of hissa. Bibliographic reference management artifact produced by *Thomson Scientific*. allows you to search databases *online*, organize references, extension files, .pdf as well as create and organize the bibliography in a text editor. source: <http://www.endnote.com>.

are Russia, Spain and Ukraine with 10% of the publications, that is, 3 articles published in the web of science database.

Graph 1 shows the top 21 countries appearing in the Scopus database publications and Graph 2 of the six countries appearing in the web of science database publication.

Figure 1 - Distribution by country of work

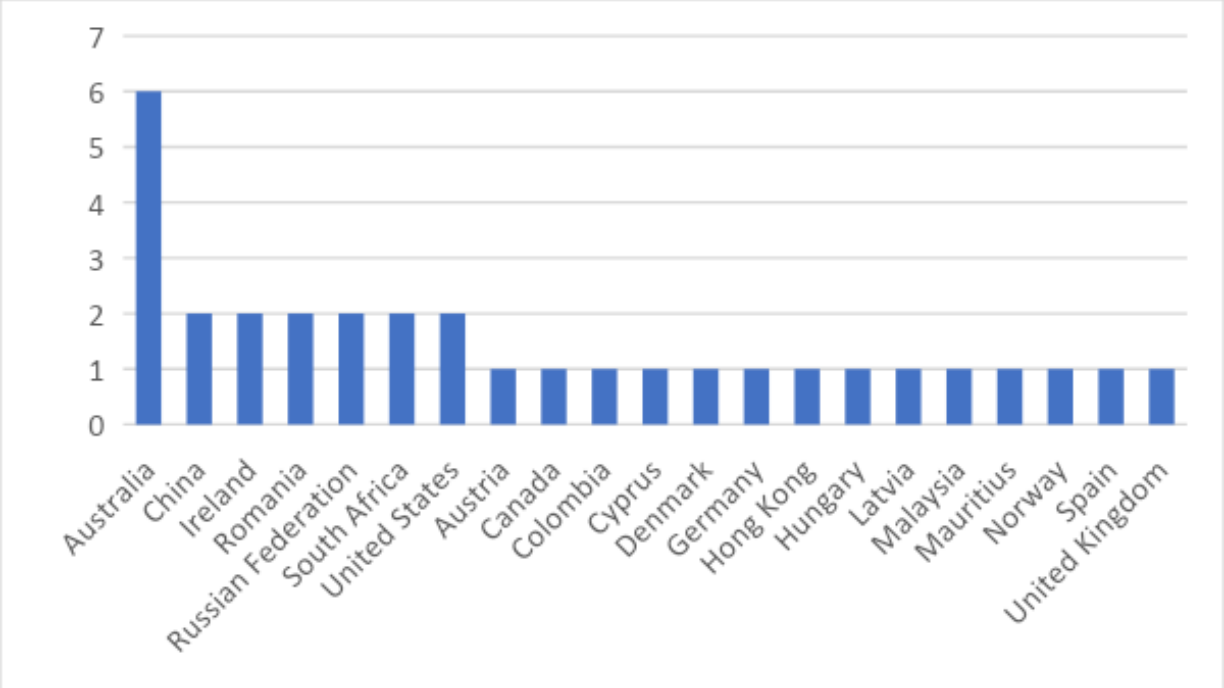
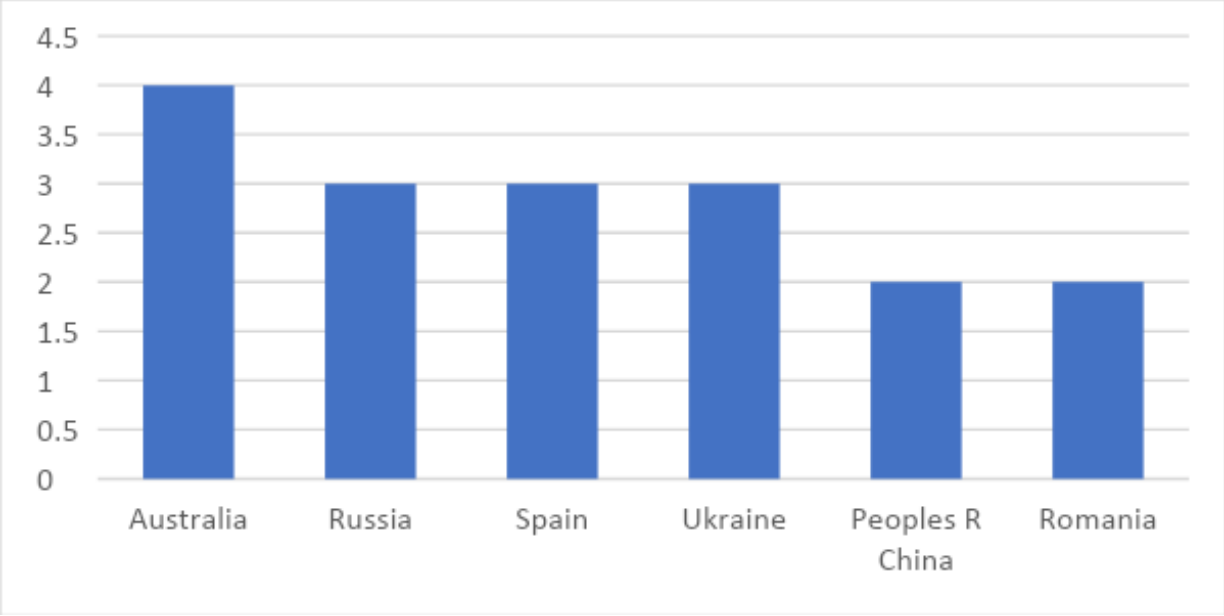



Figure 2 - Distribution by country of work



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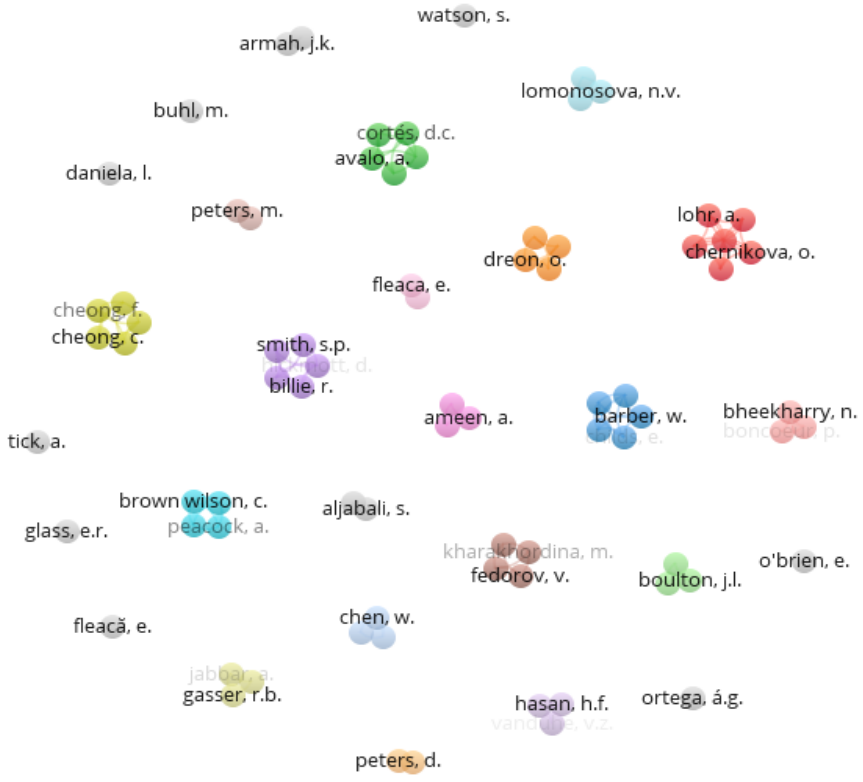
The VOSviewer program was chosen to visualize the authors' network as it employs a uniform structure of mapping and grouping (Van Eck & Waltman, 2010). VOSviewer is a network building and visualization software program that focuses on graphical representation and is useful for interpreting huge bibliometric maps.

These networks can be built based on citation relationships, bibliographic combination, co-citation or co-authorship and can include journals, authors or institutions.
The circles in the views reflect the items under investigation related to each denomination. The greater the weight of the item in the net, the larger the circle. The distance between items reflects the degree to which they are related.

The longer the link, the thicker the related lines will be. Colour and location are two methods of grouping. Thus, the analysis regarding the identification of authors was carried out, it was observed that there are no reference authors in the Scopus and web of science databases on the topic of Digital Learning Technologies in Higher Education. The first database contains 77 authors with 1 publication in this area, shown in Figure 3 below:

Figure 3 - Scopus authors



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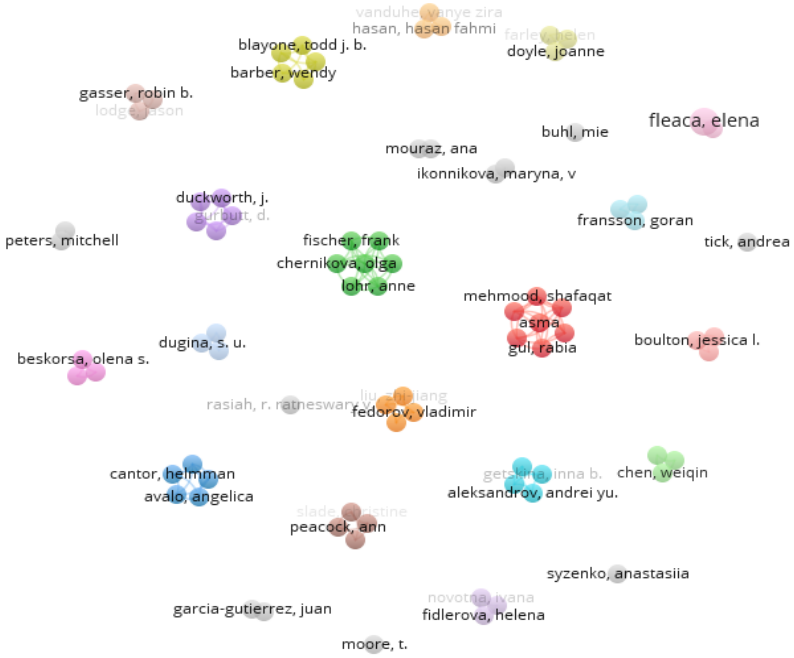
In the web of science database, the highlighted author is Elena Fleaca, from the Polytechnic University of Bucharest, Romania, with two publications. The other 83 authors who publish in this area have only one publication, as shown in Figure 4 below:

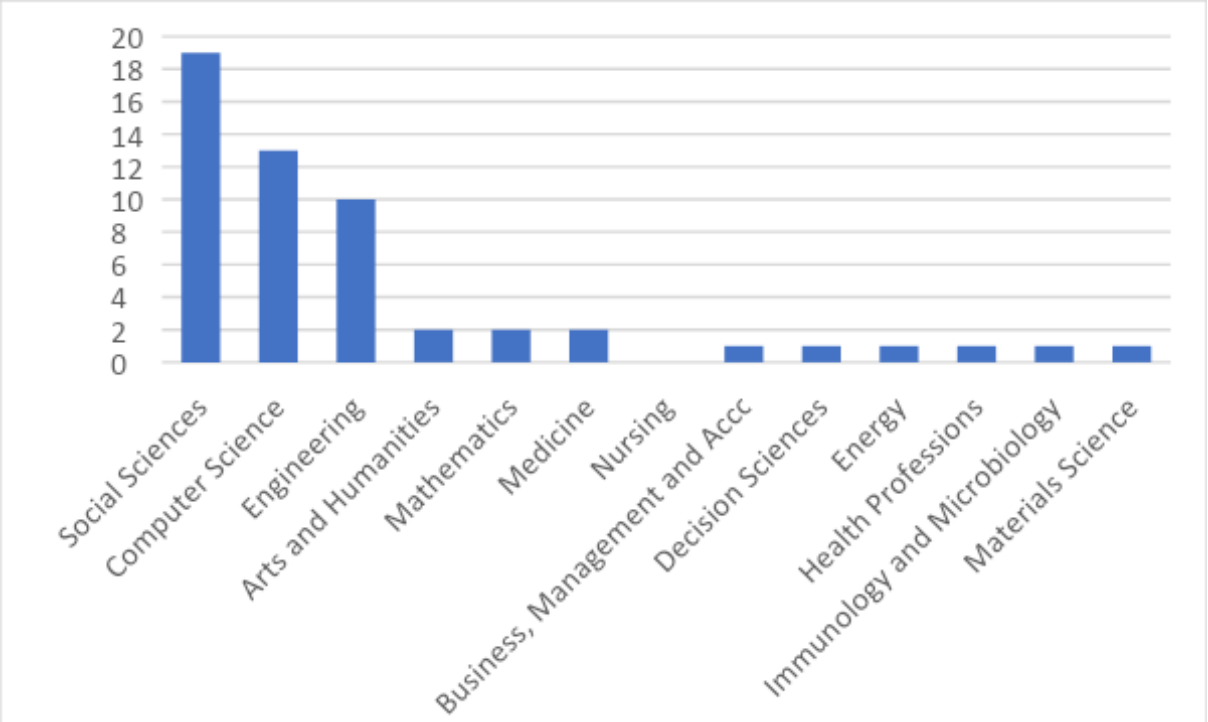
Figure 4 - Web of science authors




It is concluded that the country that most publishes in the two databases is Australia, but the affiliation that publishes is in Romania, which appears in the distribution of countries by publication in fourth place in the Scopus database and sixth in the web of science database.
From the general survey, it was also possible to analyse the type of document research in digital learning technologies in higher education. It is noticed that publications focus on journal articles in the two databases surveyed with 35%of the total number in the Scopus database and 46%in the web of Science database.

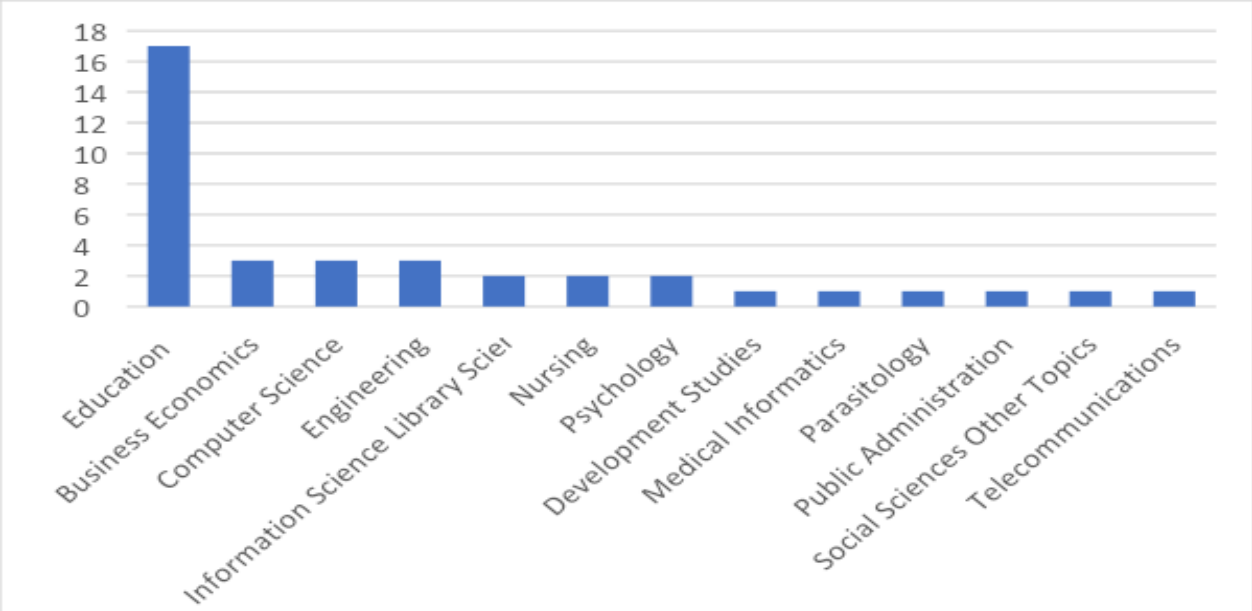
Regarding the areas of concentration of publications that are highlighted in the Scopus database, 35% concentrate in Social Sciences, 24% in the area of Computer Science, and 18% Engineering. As shown in figure 5, below:

Figure 5



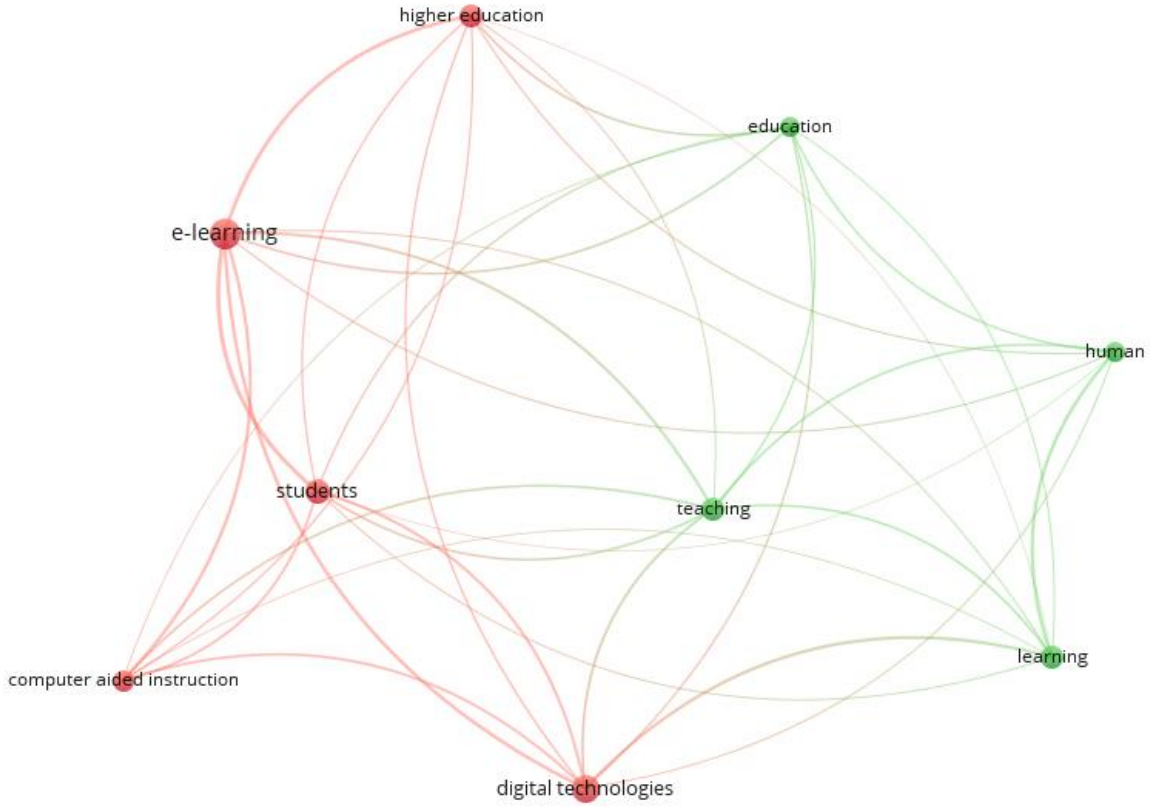

In the web of science database, the publications that have the highlight concentrate on education with 45%, according to figure 6.

Figure 6



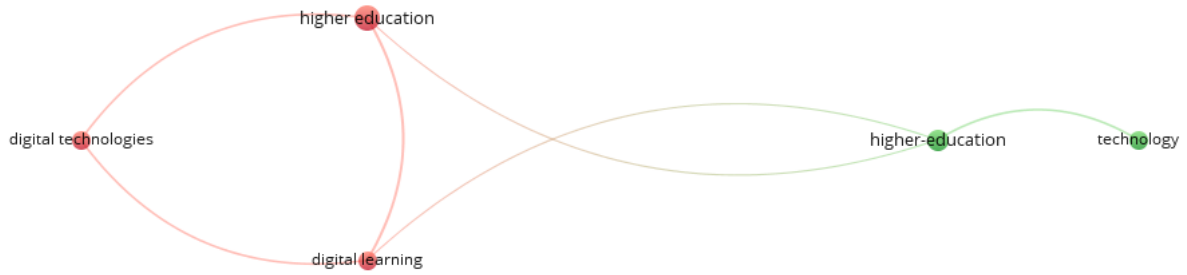

Based on the bibliometric analysis, based on the work group retrieved, there were 242 occurrences based on the Scopus databases. Then, it was found that nine words are highlighted in the Scopus database, which are: "E-learning", digital technologies, students, teaching, education, higher education, computer-aided instruction, learning and human, from the recovered works, showing the keywords, as shown in Figure 7.

Figure 7 - Tag cloud Scopus




In the web of science database, 168 occurrences were found. It was found that five words are highlighted in the database: digital learning, higher education, digital technologies, higher-education and technology, from the retrieved works, showing the keywords as shown in Figure 8.

Figure 8 - Tag cloud Scopus




After analysing the documents, it was found that 13 works appear in the two databases. The article with the highest number of citations is E-learning and nursing assessment skills and knowledge – An integrative review (McDonald, Boulton & Davis, 2018), which ranks first in the Scopus database and second most cited works in the web of database science.

The literature review was also the base to identify digital learning contexts (table 1) with the application of technology with the purpose to improve the learning outcomes and involve the students in the learning process:

*Table 1 –Digital Learning Contexts*

| **Digital learning contexts** | **Authors** |
|---|---|
| Collaborative Communities; Cooperative learning; Collaborative learning; Network participation. | Barber, W.; King, S.; Buchanan, S. (2015); Chen, Liwen; Chen, Tung-Liang; Chen, Nian-Shing (2015) Trotskovsky, E.; Sabag, N. (2015) Muñoz González, Juan Manuel; Rubio García, Sebastián; Cruz Pichardo, Ivanovna M (2015) Sohrabi, Babak; Iraj, Hamideh (2016) Liwen Chen; Tung-Liang Chen; Nian-Shing Chen *(2015)* Patricia; Curwood, Jen Scott; Carvalho, Lucila; Simpson, Alyson (2015) Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella (2015) Masterman, Elizabeth (2016) Stewart, Bonnie (2015) Liyanagunawardena, Tharindu Rekha; Lundqvist, Karsten Øster; Williams, Shirley Ann (2015) |

| Digital learning contexts | Authors |
|---|---|
| LMS; Youtube; Facebook; Instagram; Wikipedia; Linkedin; Google; Websites eLearning; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC – massive open online courses. | Tena, Rosalía Romero; Almenara, Julio Cabero; Osuna, Julio Barroso (2016)<br>Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirtee (2016)<br>Xu, Hong (2016)<br>Martin-Garcia, Antonio V.; Hernández Serrano, Mª José; Sánchez Gómez, Mª Cruz (2014)<br>Salmon, Gilly; Gregory, Janet; Lokuge Dona, Kulari; Ross, Bella (2015)<br>Guerra, Wendy Josefina Guzmán; de los Ángeles Martín Hernández, María; Pírez, Luisa Elvira Rojas (2014)<br>Stewart, Bonnie (2015)<br>McNaughton, Susan M; Westberry, Nicola C; Billot, Jennie M; Gaeta, Helen (2014) |
| Flipped classroom using digital media; Experiential online development; Open educational practice; Online learning environments; Technology integrated teaching methods; Digital storytelling; Educational games; Augmented reality; Web-based video; Digital video; Webinars | Moorefield-Lang, Heather; Hall, Tracy (2015)<br>Alhajri, S (2016)<br>Joshua Rudow & M. Anwar Sounny-Slitine (2015)<br>Unger, Daniel R.; Kulhavy, David L.; Busch-Petersen, Kai; Hung, I.-Kuai (2016)<br>Wendy Nielsen and Garry Hoban (2015)<br>Kosonen, K., Ilomäki, L. & Lakkala, M. (2015)<br>Friend, Jennifer; Militello, Matthew (2015)<br>Sungkur, Roopesh Kevin; Panchoo, Akshay; Bhoyroo, Nitisha Kirtee (2016)<br>Wood, Denise; Bilsborow, Carolyn (2014)<br>Stansbury, Jessica A.; Earnest, David R. (2017) Guerra, Wendy Josefina Guzmán; de los Ángeles Martín Hernández, María; Pírez, Luisa Elvira Rojas (2014)<br>Rai, S. S.; Gaikwad, Anil T.; Kulkarni, R. V. (2014)<br>Lau, K H Vincent (2014) |
| Project based-learning; Problem based-learning; Active learning; Gamification; Simulation; Narrated stop-motion animation | Barber, W.; King, S.; Buchanan, S. (2015)<br>Epure, Manuela; Mihães, Lorena Clara (2017)<br>Kocaman-Karoglu, Aslıhan (2016)<br>Abdulmajed, Hind; Park, Yoon Soo; Tekian, Ara (2015)<br>Mantri, Archana (2014)<br>Amory, Alan (2014) |

Table 2 shows the learning analytics associated to the assessment of the students, learning contexts, learning processes and learning facilitators:

*Table 2 – Learning Analytics for Digital Learning Assessment in Higher Education*

| Dimensions | Digital learning contexts | Learning Analytics |
|---|---|---|
| **Students** | Collaborative Communities; Cooperative learning; Collaborative learning; Network participation. | – New Knowledge/Skills;<br>– Learning Outcomes;<br>– Grades;<br>– Number of active participations;<br>– Number of the nodes of the network;<br>– Number of the students in each node of the network;<br>– Number of the students in each community. |
| **Learning Contexts** | LMS; Youtube; Facebook; Instagram; Wikipedia; Linkedin; Google; Websites eLearning; Mobile learning; Learning object repository; Blended learning; Blackboard; Moodle Learning Manager; Twitter; Videoconferencing; MOOC – massive open online courses. | - YouTube Analytics;<br>- Google Analytics;<br>- AdWords. |
| **Learning processes** | Flipped classroom using digital media; Experiential online development; Open educational practice; Online learning environments; Technology integrated teaching methods; Digital storytelling; Educational games; Augmented reality; Web-based video; Digital video; Webinars | – Feedback;<br>– Course starts/course completions;<br>– Test results;<br>– Skill levels;<br>– Performance reviews;<br>– Course access points;<br>– Time on the system;<br>– Clicks and scrolling;<br>– Number of game wins;<br>– Number of visualizations;<br>– Number of webinars/videos/games;<br>– Number of participants on the webinars/games;<br>– Number of accesses to Open Education Platforms;<br>– Number of new digital learning experiences. |

| Dimensions | Digital learning contexts | Learning Analytics |
|---|---|---|
| **Learning facilitators** | Project based-learning; Problem based-learning; Active learning; Gamification; Simulation; Narrated stop-motion animation | – Assessment scores;<br>– Number of simulations;<br>– Number of problems solved;<br>– Number of projects conceived;<br>– Number of projects implemented;<br>– Number of companies/institutions involved in the pedagogical practices;<br>– Engagement of the students in learning activities;<br>– Engagement of the students with educational resources or tools;<br>– Engagement of the students in discussion activities. |

All the digital tools of learning present in table 1 and table 2, when used in learning contexts, like spaces, facts or situations of learning supported by innovative pedagogical models, can empower learners, facilitating and promoting the learning process.

**1.4 Discussion and Conclusions**

Through a bibliometric study, we sought to understand the academic production about digital learning technologies in higher education. In both databases, 28 works were retrieved. In the Scopus database, the works were registered between the years 2001 to 2021 and in the web of science database between the years 2014 to 2021. It was found that the country that most publishes in the two databases is Australia, but the affiliation it publishes is in Romania, which appears in the distribution of countries by publication in fourth place in the Scopus database and sixth in the web of science database.

It was found that they present characteristics of diversity and interdisciplinarity, involving areas of knowledge related to Social Sciences in the Scopus database and in the web of Science Education database. Furthermore, analysis of the most used keywords demonstrates that digital learning technologies appear as a topic related to the words "E-learning", digital technologies, students, teaching, education, higher education, computer-aided instruction, learning and human in the web of science database related to the words digital learning, higher education, digital technologies, higher education, and technology.

Concluding that the theme is relevant in the process of digital teaching and learning in higher education, but there are no authors referenced in the Scopus database and in the web of science database there is a prominent author Elena Fleaca, from the Polytechnic University of Bucharest, Romania, with two publications.

As limitations, the method presented here does not have the capacity to qualitatively identify the theme of digital learning technologies in higher education and, therefore, it recommends carrying out systematic literature reviews that allow for broadening and deepening the analysis carried out here.

Finally, it appears that the teaching and learning process must adopt digital technologies to promote the development of digital higher education based on games, Moocs, direct and interactive feedback, among others. The topic still lacks much research, therefore, for future studies, research on digital competences for higher education teachers is suggested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# Sustainable Digital Education at ISCTE

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**Abstract** The purpose of this study is to examine the understanding of contexts for a sustainable Education at ISCTE. The lines of analysis of this research were oriented according to the following research questions: RQ1) Which digital learning pedagogies and technologies were implemented at ISCTE to potentiate a sustainable Digital Education? A literature review was conducted to create a theoretical framework for the research, and also was made an analysis of the digital learning pedagogies and technologies implemented at ISCTE. The results show that it is possible to create a more sustainable education using different pedagogies and technologies. The results allow us to define guidelines to build recommendations for sustainable digital education.

**Keywords**: Sustainable, Education, Digital Education, Digital Learning Pedagogies, Digital Learning Technologies

## Introduction

The possibilities of increasingly interactive resources in the globalized world have changed the concept of communication and sharing of education linked to innovative technologies. Since the technology linked to communication contributes to access to education and this has been expanded through digital communication networks. The diverse paths taken by innovation linked to technology point to different realities and orientations in the process, new methods in the educational context.

Educational methodologies and practices have changed over the years. Today, the educator has interaction technologies, such as digital boards, web conferences and other tools to enhance the process of teaching and learning, in addition to expanding his performance and thus helping people with disabilities. Many of the "new" ways of learning and teaching were motivated by the advancement of technologies, but specifically, the emergence of Digital Communication Technologies (TCD). These digital tools have contributed as strategies that offer resources to deal with the growing
production and dissemination of knowledge. In the late 1990s, last century, the web enabled new forms of computer-based learning (Moore; Kearsley, 2008).

This consolidation took place from a system called the world wide web (www), enabling virtual classrooms, aiming to take a great advantage of the internet and the web for



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education. This change in teaching, driven by the integration of technologies, brought elements innovative for learning, as it was characterized by the provision of texts, audio and video on the same communication platform, enabling the transposition of geographical, temporal and mainly communication barriers.

**Theoretical Framework: Digital Education as a Driver of Sustainability**

Educators are using technology to engage students in the learning process, and numerous studies have shown evidence of increased interest to learn when digital devices are incorporated into the learning environment.

The strategies to include technologies in the educational context can be defined as (Sousa and Costa, 2014; Sousa et al, 2017; Sousa et al., 2018): A - Open strategy, which establishes access to information and production of knowledge for all, with a focus on flexible content; Constructive strategy, which integrates openness to new spaces of knowledge, with its progressive construction; and I-Interactive strategy, which presupposes the development of the interactive processes that occur in the virtual environment.

These strategies become more important in current times, helping to develop a more inclusive, innovative, and with more quality Education, contributing to eradicate poverty, in line with the UN Sustainable Development Goals (1- No poverty, 4 Quality education and 10 Reduced inequalities).

In line with the studies already done regarding the integration of technologies in the learning process to make it more flexible and inclusive, it is possible to identify a) The implementation of e-books and tablets in education with the aim of reducing costs with textbooks (Sousa and Costa, 2014), focused on the integration and application of technologies (iPad) in the learning process; Plopper, and Conaway (2013), sought to know how students used digital tools in the learning process; Baturay focused on the technological change and professional control of teachers; and in the last years several studies have been made about Open Education Resources as MOOCS (2015) and the influence on the students achievement and performance.

During the second half of the twentieth century, knowledge of environmental issues and improvements was increasing. As a result of developments in digital technologies and globalization, human culture has evolved in a diverse way, in addition to environmental improvements. Today's world's socioeconomic system and economic circumstances have contributed to growing regional disparity and polarization in society. It has been extremely important to consider the convergence of political, social, and economic dimensions for human and natural processes (Liu et al., 2007).

**Educational Pedagogy and Applied Technologies**

Digital learning has assumed a maximum relevance, as all the countries needed to define and implement policies to implement social distance, to overcome the impossibility of presential classes the educational institutions began to have classes online. In this case, the digital learning pedagogies and technologies implemented at ISCTE by the Professors in their classes become even more important, and table 1 systematize the main educational pedagogies implemented:

Table 1 Digital Pedagogies and Technologies

- **Digital learning pedagogies**

| | | | |
|---|---|---|---|
| Collaborative Communities; | Cooperative learning; | Collaborative learning; | Network participation. |
| Flipped classroom using digital media. | Experiential online development; | Open educational practice; | Online learning |
| eLearning | Blended learning; | Digital storytelling. | Gamification |

**Digital Learning Technologies**

| | | | | |
|---|---|---|---|---|
| Educational games; | Augmented reality. | Web-based video; | Digital video; | Webinars |
| LMS; Youtube; | Facebook; | Instagram. | Wikipedia; | Linkedin; |
| Google; | Websites | Learning object | Mobile learning; | Learning Repositories; |
| | Blackboard | Moodle | | |

These digital educational pedagogies and tools presented in table 1 can facilitate and promote the learning process, and respond to the research question:

RQ1) Which digital learning pedagogies and technologies were implemented at ISCTE to potentiate a sustainable Digital Education?

In this respect the main pedagogies found were: Collaborative Communities; Cooperative learning; Digital combinational system; Collaborative learning; Flipped classroom using digital media; Moving from fixing to online space; Experiential online development; Open educational practice; Network participation. And the digital learning methodologies used in those contexts are new methods of teaching using technology with the purpose to improve

the quality of education and involve students in the educational process: Project based-learning; Problem based-learning; Digital stories; Online learning environments; Digital

Moments; Technology integrated teaching methods; Digital storytelling; Educational games; Authentic learning.

**Evaluation Process**

In the selection and administration of evaluation instruments, practical issues such as ease of administration, time required for administration, ease of communication and application of results, availability of equivalent forms, costs, cannot be neglected. Nevertheless, the assessment of the students is a very important issue for ISCTE and some dimensions are always considered: Control acquired knowledge and skills; and determine individual progress.

In the following table (2) it is possible to analyses the main assessment techniques.

Table 2 - Learning assessment techniques

| **Assessment Technique** | **Objective** | **Description** |
|---|---|---|
| Testing | Tests are used to evaluate the students' knowledge. | 1) Written<br>– Test brief or extensive.<br>– Tests with short response, completement, alternative response, multiple choice and combination.<br>2) Practical<br>– Test of procedures or process tests. |
| Reports | It seeks to obtain the views of the student (in writing or orally) about a given situation or to assess his/her knowledge and ability to communicate. | 1) Presentations<br>2) Questions<br>3) Reports |
| Observation | To assess psychomotor or social behavior (attitudes) of students | 1) Records ("anecdotal records") - Brief descriptions of an individual's behavior.<br>2) Checklist - to evaluate, step by step, the execution of a given task.<br>3) Rating scales - to grade a particular quality or particular characteristic. |

**Final Considerations**

This research intends to contribute for a more sustainable education suggesting important recommendations for Higher Education Institutions:

-

- Promote the use of digital learning pedagogies and technologies, which enables learning, it is easy to use, and has rich content, high efficiency, flexibility, security, reliability,
- interactivity, portability, and other features that can be used to compete with other teaching methods.
- Define measures to implement adaptable learning strategies, tools, and resources to promote the use of digital learning.
- Incentive the creation of a culture where the role of the teacher changes from a primary source of information into secondary source of information and a facilitator guiding the students in the learning process.
- Promote technology innovation into classrooms, creating infrastructures to enable the implementation of digital Learning strategies; designing technology-integrated learning will continue playing a crucial role.
- A consistent and structural change in the learning strategies will allow the students to acquire competencies as problem solving, collaboration and communication, and will provide means for all students in a global way.

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# Providing an intercultural experience in the classroom with a COIL project

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**Abstract**

How can students be prepared to work in an international and intercultural environment when, for various reasons, they cannot benefit from international mobility (study abroad)? This pedagogical experience was undertaken during the Covid crisis to train students to work in an international work environment while staying at home. It consisted of an international learning project carried out by mixed groups of students consisting of students from two collaborating classes - one in France and the other in the USA. They collaborated through technological devices and developed joint deliverables.

**key words:** International, intercultural, collaborative, virtual, pedagogical project

## Introduction

Whether due to cost, student employment or particular personal situations, a significant proportion of students cannot enjoy the opportunity to study abroad. However, employers are now requiring that employees have the skills needed to work in intercultural and international environments. How can students be prepared to work in an international and intercultural environment when teaching takes place mainly within four walls in a classroom with a limited international audience? The pedagogical experience discussed in this chapter was meant to address this issue. It brought together students from two classes, one in France and one in the USA, to work on a collaborative project across borders in October through December of 2020.

## Theoretical framework

A COIL (*collaborative on-line international learning*) project is a learning project that allows students to experience work in an international and intercultural context without physically

travelling to another country. COIL is part of a broader set of educational practices that are grouped under the terms of *internationalization at home*.

A COIL project can take many forms but it always consists of organizing a pedagogical activity involving several groups of students located in several countries so that they can confront differences in cultures and contexts and thus develop intercultural skills based on direct experience. The philosophy is therefore to learn by doing and by having a reflective approach to one's experience.

Intercultural skills include several components (Faust, 2015). First, they include a cognitive dimension, also known as cultural competence, which consists of having specific knowledge about other cultures. This knowledge refers to general knowledge (geographical, historical, political, economic, etc.) about a country or region in order to understand the context of the interlocutors from these countries. They include knowledge about the interpretive logic used in this society to make sense of social situations and to know what types of behaviors are appropriate or inappropriate in different circumstances. Cognitive skills also include the ability to understand and express oneself in the language(s) associated with a culture. The cognitive dimension also includes knowledge not specific to a culture but about the diversity of cultures in general; awareness of what varies according to cultures and language skills in a lingua franca shared with the participants (often English) even if it is not the first language of the participants. The second dimension is emotional competence. An intercultural situation like any situation that has a large unknown part is likely to generate stress but also negative judgments about what is unexpected. Emotional competence is therefore linked to the ability to manage stress related to uncertainty, to put judgment aside, to accept differences but also to enjoy positive emotions induced by new and stimulating situations. This leads us to the third dimension of intercultural competence, namely motivational competence, which refers to the willingness to engage in positive intercultural exchange and to see interaction succeed. It is the desire to work in an intercultural environment, the interest in a new environment and to be part of international teams. The fourth dimension, the behavioural dimension, refers to the mobilization of knowledge to enable satisfactory interaction. This means that individuals are willing to change their usual ways of doing things and to give up proven methods to experiment with new ways of working based on how they have understood the expectations of those around them. The behavioral dimension refers, for example, to the ability to communicate effectively verbally and non-verbally by mobilizing language proficiency and cultural knowledge. Some authors add an identity dimension which consists of knowing how to maintain one's identity coherence while the intercultural encounter is likely to challenge it to some degree.

This overview of the dimensions that make up intercultural competence shows that only the cognitive aspects of its development can be addressed through traditional teaching that emphasizes the transmission and appropriation of content. The emotional, behavioural and motivational dimensions can only develop in action, and the COIL project enables this kind of learning.

**Educational Pedagogy**

The objectives of a COIL project are to develop all the dimensions of intercultural competence, with particular emphasis on the cognitive, affective and behavioural dimensions. The aim is to (1) broaden the students' perspective on the content of the COIL project subject by

discovering different points of view or approaches developed in different countries, (2) experiment with international teamwork and reflect on their behaviour during this work, in order to identify their reactions to uncertainty and judgments about differences and (3) to test their capacities for communication in a second language and adaptation in an intercultural environment.

Another objective is to develop virtual teamwork skills using communication technologies. These skills, combined with intercultural skills, fall within the scope of general management and project management in particular: knowing how to agree on objectives, coordinate everyone's work, respect expectations and deadlines, manage potential conflicts, keep peers informed of progress, etc. Working at a distance from co-located work leads to a lack of visibility on the progress and content of each other's work, which requires fine coordination to avoid disappointments.

In the following sections, we describe a COIL experience conducted between a bachelor class of 28 students in International Management in Université Gustave Eiffel (France) and a class of 14 students from various disciplinary backgrounds in University of Texas at Dallas (Honors College).

*Professors' preparation of the Coil project*

As a first step, we as the respective professors of these classes identified the classes that could be matched, agreed on the learning outcomes and the skills to be acquired, and started building the training program. It is not necessary that the courses are the same or even within the same discipline. Even when the students do not come from identical backgrounds and programs, they can bring complementary perspectives on a common subject. For example, in our case, students worked together on how firms could play a role in fighting socio-economic inequalities in France and USA as part of a program of corporate social responsibility.

Once the general theme and the disciplinary and soft skills to be developed had been defined, we had to determine the organizational arrangements concerning:

- the teams: Ideally, student teams are formed with an equal number of members from each partner university. The imbalance in the number of students led us to design teams of 6 students, each one including 4 French students and 2 US students;
- the COIL calendar: an 8 week-long project;
- the resources given to students: communication tools (Padlet, ZOOM) and e-learning platforms (different for each university), teachers' lectures, thematic or methodological video clips made available on a shared space, common and

- differentiated bibliographic references (including work in the first languages of the students involved), useful websites, experts to consult, etc.;
- the details of the deliverables (language, format, length, deadline, delivery space);
- the assessments (final oral presentation, self-report on the experience).

The coordination of common time slots in student schedules and the scheduling of rooms equipped with the necessary equipment had also to be made in advance.

*Implementation of the Coil project*

The presentation of the COIL project was made separately by the teachers to each class in the introduction of the course in which the COIL project was to take place.

Students were asked to prepare a brief oral presentation about themselves, to identify a common stereotype about the other country, and to identify one reason for the development of poverty in their respective country in a short video posted on Padlet for everyone to review. To ensure that all students watch the videos, we asked students to post comments and questions for their classmates below the videos on Padlet. At the same time, students from Université Gustave Eiffel started to review the material provided on the learning platform concerning socio-economic inequalities. Within three weeks from the start of the course, students were required to post a critical review of the materials emphasizing what they had learnt from the comparison between the two countries.

A first synchronous session was organized so that the two classes could see and talk to each other. This was an important activity to 'break the ice' as most students are pretty anxious to meet unknown people. After a brief reminder about the objectives of the project by the professors, the entire joint class was broken into small mixed groups in on-line break-out rooms where they could discuss what they had posted in their videos (mutual stereotypes, causes of poverty). We had time for three successive small groups. This enabled the students to meet different classmates and start discussions in small groups.

Just after the joint session, the student project teams were composed by the teachers in a complementary perspective. Criteria such as gender diversity and language level were considered in the group constitution to ensure that all teams included French students who were sufficiently proficient in English.

During the following weeks, the groups of students had to self-organize to meet virtually with whatever tools they chose to define their project topic. Many used WhatsApp or Zoom for their weekly meetings.

A second synchronous session was organized to introduce the chosen project topics (for example: poverty and housing; the transition to eco-friendly transportation and its impact on poverty; unemployment aid programs, etc.) and to give feedback on selected topics (for

example: narrow the focus of the project, be careful to avoid overlap with another team, do not forget to include the role of corporations in the issue, etc.)

After three weeks of teamwork in autonomy, the highlight of the COIL project was the synchronous final presentations of the teams. Each team had only 10 minutes to present their main results based on a slideshow, but each student was requested to speak. The limited amount of time was due to the number of teams (7) who had to present in a 90-minute session.

The overall quality of the presentations was very high. Obviously, they had rehearsed for seamless transitions and respect of the tight time frame. The presentations demonstrated the engagement of students in the research activity. They came up with detailed examples and information or creative ideas to address some of the issues. It proved to be a rich session which allowed students' learning and perspectives to be shared across the two classes. It was especially interesting that in some teams, students presented facts that concerned their counterparts' country showing that they did not conduct separate research and compile it but really shared and learnt across borders.

As the session was short, we could not provide immediate feedback on the presentations but one week later we had a last synchronous session to hear their feedback on the experience and their suggestions to improve the process. Of course, not all the groups had the same dynamics and some groups experienced higher satisfaction in regard to their group interactions than did others. Some said they even took the opportunity to share personal details about their housing, family and neighbourhoods and felt that they had become friends with their group members. Others regretted that they had only focused on getting the work done and that some members did not allow space for more personal side discussions. Some participants in the less satisfied groups suggested having the opportunity to work in a number of different groups and not to be limited to just one group for the entire project. Some also regretted that the very short final presentations (10 minutes) did not do justice to the amount of work they had carried out to fully research the issue they had selected. Most importantly, all enjoyed the experience even if they initially believed it would be a challenge.

**Evaluation process**

The evaluation process comprised different assessments. Several skill development outcomes were expected in this COIL project:

- skills with regards to the topic of the COIL project (critically examining and designing policies and practices to involve companies to reduce socio-economic inequalities in companies);
- project management skills (organizing a virtual team, coordinating work, meeting deadlines, managing the progress of a project at distance);
- intercultural skills (communicating across borders and for some in a second language, decoding cultural differences, adapting to different contexts and ways of doing things);

The assessment of the project was based on several deliverables. The assessment of the students from Université Gustave Eiffel included the following components:
- an individual critical review of the material to gain knowledge on the content of the project
- the collective presentation and slide show,
- individual comments on other teams' work,
- an individual self-report about their learning concerning intercultural work.

The first and the last deliverable were graded only by the French teacher based on the assessment of knowledge and analytical skills. In the final self-report, each student had to demonstrate their ability to work at distance in an intercultural environment by showcasing

some of their actions and analysing some of their behaviours during the work. This reflexivity makes it possible to formalize the learning achieved through the project.

However, this reflective work is difficult; students are often tempted to adhere to a factual description of the stages of the work on the one hand and to general statements about the learning that they believe they have achieved on the other. The reflective and distanced analysis of their action requires close support to help them describe specific behaviours and their effects on the team or collective work. The scaffolding of this portfolio building has to be developed to help all students succeed in this exercise.

The presentation and slides were assessed jointly by the two professors and took into account many criteria: the relevance of the introduction and its ability to engage the audience, the quality of the USA/France comparison, the relevance and originality of the recommendations, the research incorporation, the use of proper resources, the teamwork and coordination of the team, the quality of oral and written communications. Most of the time assessments between professors converged but, in a few cases, different weights were assigned to the same element and ended in a different rate for one given criteria.

The assessment itself is intercultural and contributes to students' awareness of cultural differences as teachers are themselves sensitive to different elements. In addition, educational pathways in the different countries develop more or less certain skills and this is reflected in the productions. For example, education in France emphasizes the argumentation and logical structuring of ideas by having students writing a lot of essays throughout their education. The rigour of articulation is often a strong point of the students and an expectation of French teachers.
On the other hand, French students are often less comfortable with public speaking and with the improvisation required by the answers to questions compared to those trained in the USA.

The comments of non-French evaluators on these points are therefore instructive. It is also possible to supplement the teachers' points of view with a student peer review. The comments of the students on other teams' work were not graded per se but resulted in bonuses to the final grade when they were constructive, thoughtful and developed beyond just words of appreciation.

**Final considerations**

COIL can be used in many courses with different themes to contribute to internationalization at home. It contributes to the development of certain dimensions of intercultural competencies that cannot be developed through traditional education.

COIL is not expensive. It is also very flexible and can be adapted to different contexts but it requires preparation beforehand and above all requires good collaboration between the teachers involved. The first challenge is to locate a partner with common interests in pedagogical innovation and to identify two groups of students of equivalent size with compatible timetables, a manageable time difference and course content that can be easily articulated in a project. The second challenge is to organize the pedagogical sequence

coordinated beforehand. For example, anticipating course enrolment before the semester starts can be complicated, especially when some courses are optional and sometimes. It is often necessary to adapt to an unbalanced number of students.

In general, the better the knowledge of the partner's context, the easier the collaboration. It is recommended to start with shorter and time-limited projects and to extend their scope with experience. In addition, the initial investment can be valued over several years and contribute more broadly to the development of institutional partnerships.

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SUNY COIL Centre: http://coil.suny.edu

Erasmus Virtual Exchange: https://europa.eu/youth/erasmusvirtual_en

Uni-collaboration: http://uni-collaboration.eu/node/818

# Digital Learning Experience From Webwise

**Madeira Specialist – A gamified learning experience**

**Maria do Céu Ferreira, Webwise**
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**Abstract**
How can people access contents and update their knowledge whenever they want, wherever they need and maintain their motivation on learning, preparing for lifelong training?
The pedagogical experiments implemented to answer these needs were based on a platform that delivers multimedia and video contents, “snack-learning” contents with a maximum of 1 minute length; self-evaluation quizzes and gamified motivation mechanics.

**key words:** lifelong learning, gamification, snack-learning, video and multimedia contents

**Introduction**
Madeira Tourism Bureau started an e-learning strategy 10 years ago. The main goal to the starting point was simple: digitalize contents and make them available for people characterized by diversity and short free time. The contents were mainly images, texts and some long institutional videos. The experience was positive. Students were engaged and enjoyed this new approach of learning. The first step on digital learning was launched!
The next step was taken 5 years later, when almost all the digital contents were transformed into rich media, mainly videos and infographics, and changed the pedagogical strategy to a more visual approach. The results were even better and the rate of certifications was higher.
The final challenge to improve certifications´ rate was launched in 2018. At this time the focus was in two variables: improve **contents** and **methodologies** to engage students.

**Theoretical framework**
Gamification mechanics is being used worldwide mainly in organizational context to improve engagement and motivation with substantial results. The use of these concepts in educational and training environments aim to improve learning results, shorten the learnership curve and introduce fun in learning processes, engaging students.
This project combined some principles of gamification – Points, Rankings, Badges and Levels, Teamwork and Individual achievements – with short rich media content to facilitate the learnership process. This methodology was grounded to explore emotional and motivational skills based on a self-learning approach, promoting autonomy among students, while fitting some changes in students' profiles and characteristics related with a shorter span of attention, time availability and the ubiquitous technology, as smartphones spread worldwide.

**Educational Pedagogy**

The pedagogical strategy adopted in this gamified learning experience aimed to diminish the students´ course drop, grounded on 3 principles:

(1) implement some mechanics that gave fun and improve users´ experience in learning moments, motivate them;

(2) create short moments of learnership, able to adapt to short attention span of students, improving their skills, and maximize learning;

(3) transfer the contents to mobile smartphones, avoiding space/time constraints.

These students had already experienced an e-learning environment and the causes of a medium drop rate had been identified:

1. Content´s length and type: most of the contents were videos of 5 minutes, and text documents to be read on the computer or downloaded;
2. Mandatory learning path: students had to follow a learning structure;
3. An extended final and global evaluation with 50 questions;
4. The online environment is only available on computers and desktop devices.

To answer these constrains the platform was reinvented and it was designed an environment of “adventure” in which, each student had to perform the role of an explorer, visiting freely the available contents, designing their own user journey, as they won Points and Badges and evolves in a set of mastery Levels. This “game oriented learning” helped students to stay engaged and motivate themselves (intrinsic motivation) as they felt they were competing with their peers or combining teamwork to strengthen the position.

Rankings (individual and teams) and a real time activity feed, fed the engagement and the competition/cooperation and give visibility for those who had good performances. These game mechanics – Rankings, Points, Badges and Levels – and the visibility for the best players individually or in their teams, guaranteed the permanent engagement of students and the completion of the training path. For the most competitive players, they had a set of informal extra contents - curiosities, hints…-, not mandatory, for those who wanted to win more points and get a better position in the ranking.

Also, and related with contents, 2 changes were made:

- Segment the large videos in small parts, with 1 minute maximum, meeting the short span of attention among people in general, and students in particular, mainly belonging to Generation Z. Another change in the methodology was the type and time of exercises and evaluations.
- Assessment moments became softer as they were presented as challenges in between the didactic content attendance. They were also shifted from extended modular evaluations to short quizzes to test the contents they were just seen, also replacing the heavy and global summative evaluation. The real time feedback gave them the consciousness of the effective acquisition of knowledge and the opportunity to revisit the contents that were not consolidated and had better scores.

The distribution platform also evolved and came to a cross platform approach, extending the access to the contents to mobile smart phones, through an APP.

**Applied technology**

Nowadays, smartphones and tablets (mobile devices) are increasingly used instead of desktop computers to access web-pages and platforms in every context, namely in teaching-learning processes. Also, the proficiency of using mobile devices as well as the permanent connection to the internet, with the evolution of 4G and 5G protocols, determines that students are always on and want to manage their learning/work time with no space or time constraints.

Using these trends, the gamified platform was used in a cross-platform approach, in which students were able to choose the time frame to complete tasks, the most suitable time for each one and if they want to be seat in front of a computer or in a mobile device where ever they are and attending lessons or doing some quizzes to self-evaluate.

This strategy of multiple devices extended the opportunities to learn, as students had the possibility to learn informal classes/environments, but also in informal spaces; with their mobile phones they can access the Apps and take some “snack-learnings” as they have some free time and learn with no time/space limitations.

**Evaluation Process**

As the students moved from a traditional e-learning model to a gamified environment, with short contents, rich content and frequent assessment moments where they had the possibility to choose their own training path as well as the best time/space to learn, the drop rate fell considerably.

**Final considerations**

With these strategies the completion of the training path and certifications arose when compared with the previous approach, based on a classical e-learning platform.

The impact of this strategy was felt not only in learning results, as rates had arisen, but also in soft-skills development as students increased the capability to autonomous learning and time management, so important and valorised in real work space.

A gamified environment – tech or not – can bring adrenaline to teaching/learning processes, engaging students, promoting self-responsibility and internal motivation and maintaining students committed to learning.

# Digital Learning Experience From UTAS

## Digital Learning Experiences in HE: The Case of UTAS-Salalah, Oman

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**Abstract**
In recent years, digital transformation has become one of the primary foci of both scientific research and practice, especially with the outbreak of the COVID-19 pandemic, which in turn has raised a crucial call to adopt digital and innovative technologies for operations and practices within all industries and their associated sectors, encompassing the higher education sector. Consequently, higher education institutions (HEIs) are requested to evolve a high-performing and tenacious digital learning ecosystem depending on functional online teaching-related platforms and effective evaluation procedures and techniques. To this end, the current work is to provide solid evidence on digital learning experiences in HEIs in the Sultanate of Oman by depicting a theoretical overview regarding the digital learning process and educational pedagogies in HEIs. It also comprehensively illustrates the digital learning platforms and online evaluation techniques deployed at the University of Technology and Applied Sciences (UTAS), Salalah, as a case of the current study.

**Keywords:** Digitalisation; Digital Learning Experiences; Educational Pedagogies; Higher Education; UTAS-Salalah, Oman

### Introduction

Digitalisation, the leveraging of digital technologies, is considered one of the most crucial sociotechnical transformations influencing operations of all businesses and sectors all over the world (Ritala et al., 2021). With the outbreak of the COVID-19 pandemic, the inherent opportunities and challenges of digitalisation have been highlighted within different contexts (e.g. Faraj et al., 2021; Volberda et al., 2021) including the higher education context (e.g. Ahel & Lingenau, 2020).

In this vein, the present study aims to provide a clear understanding and eminent insights concerning digital learning experiences in higher education in the Sultanate of Oman. More specifically, this paper seeks to expound a theoretical background related to digital learning and educational pedagogies, considering the current situation of the COVID-19 era which forced most of the Higher Education Institutions (i.e. universities) to implement distance/online education. In addition, it provides an in-depth overview regarding the online

platforms utilised in teaching and learning activities at the University of Technology and Applied Sciences (UTAS), Salalah campus in particular. Moreover, this work demonstrates the procedures and methods employed to evaluate online teaching and learning-related tasks and activities provided by students enrolled in different academic programs that are currently offered at the UTAS-Salalah, Oman.

Taken all collectively, the current chapter contributes to the extant literature in digital education within the context of HEIs by highlighting the relevance of digital learning and its connected pedagogies and strategies. Furthermore, this study adds to the body of knowledge in educational research by outlining the digital teaching and learning-related platforms as well as the evaluation process deployed in one of the most distinguished higher education institutions in Oman, namely the UTAS-Salalah.

The rest of this chapter will be structured as follows: In Section 2, the theoretical framework of digital learning is provided. Educational pedagogy is elucidated in the third section, while a short brief on the case of the current study (UTAS-Salalah) is given in Section 4. Section 5 demonstrates the applied technologies of digital learning at the UTAS Salalah. The sixth section demonstrates the evaluation process, while the last section outlines the final considerations of the present piece of research.

## 2. Theoretical Framework

Digitalisation has unlocked umpteen opportunities in the field of the education ecosystem. The dynamic proliferation of online learning systems has been able to accommodate the widespread changing needs of the industry. Quality education is accessible anytime from anywhere with the availability of proper platforms, devices and internet connection (Mei, 2019). Learning is considered to be lifelong and technological advancements prove that the best education programs teach us to be determined learners to thrive in diverse environments. The pandemic accelerated the revolution of online education (Zawacki-Richter, 2021). Virtual classrooms have replaced the conventional classroom which has paved the way to learn the technological features along with the subject content. The benefits for learners of moving to online provision are ostensibly multiple. For those learners who are unable to attend the face-to-face classes due to work commitments, caring responsibilities, or disability, online learning helps engage both synchronously as well as asynchronously (Marr, 2018).

A UNESCO report states that the COVID-19 pandemic has caused the most widespread disruption to education systems in global history. Schools and universities in more than 190 countries were closed at the height of the pandemic, impacting over 90 percent of the world's student population. Digital approaches to education during the COVID-19 pandemic were especially common, making it possible to deliver some form of education in all countries of the world, even if not to everyone. Accordingly, digital technologies can no longer be seen as

a luxury – instead, they have become a social necessity to support education as a human right, for the common and public good (Fengchun & Wayne, 2021).

The present study provides details on the adoption of digital learning technologies and platforms at UTAS-Salalah by aligning the learning design and approaches to knowledge delivery to enhance the quality of teacher-learner engagement.

## 3. Educational Pedagogy

Education has been the bedrock of the development of every nation; hence its sustainability is paramount to the growth and development of all nations (Owusu-Fordjour et al., 2020). Universities play a unique role in providing education along with performing diverse roles, such as engaging in various types of research ranging from fundamental to applied (or a combination of these); fostering innovation ecosystems and knowledge transfer; collaborating with other universities and sectors beyond academic boundaries at national, regional and international level; and providing services to their connected communities through outreach activities (European Commission, 2020). Another report of the European Commission (2015) focuses on the concept of 'knowledge triangle' – the collaborative acts of learning, discovering and innovating which are compared to the three pistons of an economic engine. This is elucidated as education, research and innovation; universities, laboratories and companies; academics, researchers and entrepreneurs who are essential components of that engine.
It is seen that technological transformations have the ability to deepen, enrich and adaptively guide learning and interaction (El Firdoussi et al., 2020). The usage of technology should be designed to contribute towards cognitive and affective learning (Näykki et al., 2019). Figure 1 reflects the framework proposed by Jeong & Hmelo-Silver (2016) consisting of seven core affordances that technology facilitates in collaborative learning.

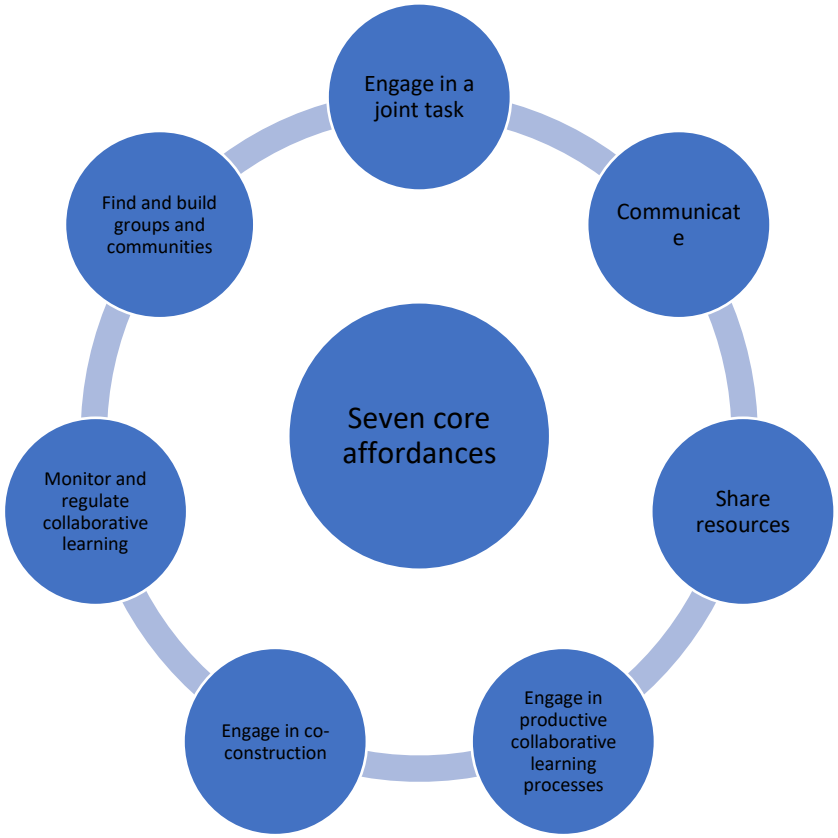


*Figure 1: Seven core affordances in collaborative learning (Source: Jeong & Hmelo-Silver 2016).*

Several arguments are associated with e-learning, while accessibility, affordability, flexibility, learning pedagogy, life-long learning, and policy are some of the arguments related to online pedagogy. Online learning serves as a 'panacea' in the time of crisis (Dhawan, 2020).

In its COVID-19 education response, UNESCO (2020) provides a list of educational applications, platforms, and resources that aim to help parents, teachers, and learners. As shown in Table 1, they are categorized based on distance learning needs, but most of them offer functionalities across multiple categories:

*Table 1: A list of educational applications, platforms, and resources*

| | |
|---|---|
| 1. | Resources to provide psychosocial support (e.g. guidance from WHO and UNICEF) |
| 2. | Digital learning management systems (e.g. Edmodo, Google Classroom, Moodle, etc.) |
| 3. | Systems built for use on basic mobile phones (e.g. Cell-Ed, KaiOS, Ustad Mobile, etc.) |
| 4. | Systems with strong offline functionality (e.g. Kolibri, Rumie, etc.) |
| 5. | Massive Open Online Course (MOOC) Platforms (e.g. Coursera, Udemy, EdX, etc.) |
| 6. | Self-directed learning content (e.g. British Council, Byju's, YouTube, etc.) |
| 7. | Mobile reading applications (e.g. Global Digital Library, Reads, etc.) |
| 8. | Collaboration platforms that support live-video communication (e.g. Teams, WhatsApp, Zoom, etc.) |
| 9. | Tools for teachers to create digital learning content (e.g. Thinglink, Nearpod, Trello, etc.) |
| 10 | External repositories of distance learning solutions (e.g. Brookings, UNEVOC resources, etc.) |

*(Source: UNESCO, 2020)*

As a result, it is essential that HEIs keep themselves synchronized with the process of: (a) globalisation and (b) technology acceleration. In this context, it is evident that globalisation is getting the world more connected with cooperation and competition – to learn, innovate or discover; while technological transformations are influencing knowledge transfer, dissemination and consumption, thanks to advancements in ICTs. This acceleration is introducing new devices to enable our connection with digital and physical works boosting our dependency on automation and deal with 'big data' while parallelly increasing machine-to-machine communication and a growing capability to shift physical environments to digital platforms (European Commission, 2015).

Technological transformations are shaping the future of higher education on a global platform. Figure 2 represents the global forces impacting the HEIs sector heading towards becoming a 'university of the future'.

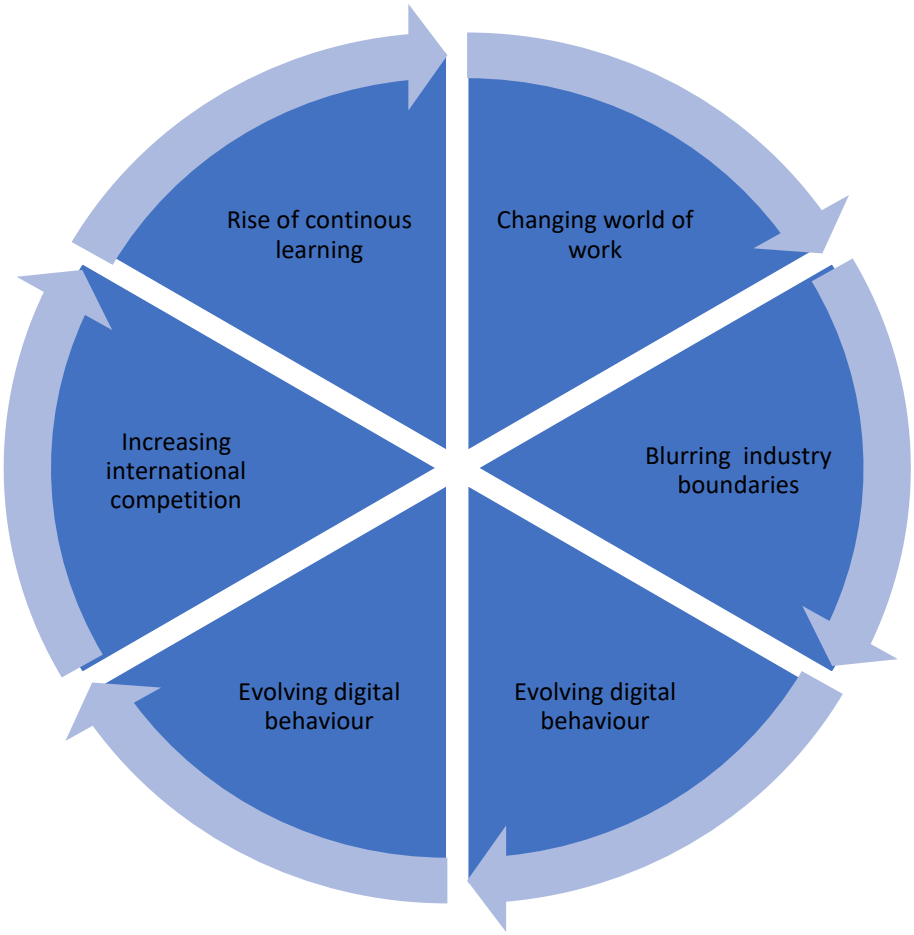


*Figure 2: Five external drivers shaping the 'university of the future' (Source: Ernst & Young, 2018)*

Digital transformation in HEIs is empowering learners (students) by encouraging them to evolve into educational services related consumers. Such consumers are shifting their activities to the digital spheres of web, mobile, social, mixed reality and virtual reality, while the digital natives are cultivating different learning behaviours and expectations. Although universities are commencing digital learning or open online courses, the student demand is outpacing the availability. Future students consider online learning as adaptable and user-friendly, thereby increasing its demand (Ernst & Young, 2018). The report further states that the landscape for higher education has been restructured due to the penetration of digital advancements like artificial intelligence, augmented reality, and virtual reality which will facilitate the transformation into a 'university of the future' aligning them to the future realm with the necessary skill sets. To keep pace with the digitised developments, HEIs are requested to prepare their programmes accordingly to cater to the evolving requirements.
Considering the global changes and rapid transformations influencing the performance of HEIs, this work sheds light on the policies and procedures deployed to adopt digital education in the University of Technology and Applied Sciences-Salalah.

## 4. The current study context

The University of Technology and Applied Sciences (UTAS)-Salalah, formerly known as College of Applied Sciences-Salalah, was established in 2006. It offers diploma and undergraduate programs in Information Technology, Business Administration and Mass Communication. This higher education provider was previously under the Ministry of Higher Education in Oman until 2019. From 2020, UTAS became an autonomous institution after the consolidation of Colleges of Applied Sciences and Colleges of Technology which have branch campuses across the country.

The present study focuses on the digital learning experience of UTAS-Salalah campus. The global pandemic brought the traditional teaching-learning experience to a standstill and made a shift to remote teaching-learning. The campus had to devise a suitable remote learning strategy that would allow participation of the learners in a learning environment to achieve the course objectives without being physically present in onsite classrooms. The study also looks into the opportunities associated with digital transformation in order to assess the changes / challenges lying ahead and provides thoughts on how digital transformation in HEIs can evolve with the changing times while aligning itself to Oman Vision 2040.

## 5. Applied Technologies

Advancement of ICTs is enabling the learners to engage with their teachers, academic advisors and peers via state-of-the-art approaches. Table 2 reveals the digital technological adaptations by UTAS-Salalah campus.

*Table 2: Digital learning platforms at UTAS-Salalah*

| |
|---|
| E-Learning |
| M-Learning |
| Hybrid E-Books |
| Simulators |
| Augmented Reality |
| Free Open Source Software (FOSS) and Online Compilers |
| Remote Screen controlling software |

### *E-Learning*

The University has signed a contract with Blackboard Learning Management Systems enabling branch campuses to circulate course materials, lecture videos, announcements, class discussions through forums to the relevant students. The Blackboard system is also used to conduct, submit, and evaluate student assessments (e.g., multiple-choice questions (MCQ), quizzes, descriptive exams, open book exams, assignments, case studies, reports, and other digital learning activities and tasks). It is also employed to check the similarities (plagiarism) of required tasks and activities submitted by students. This system can also be accessed by the

teachers and learners via its mobile-based application. Prior studies conducted to assess the usability of Blackboard system at UTAS-Salalah (Balaji & Malathi, 2021; Al Shanfari & Fatnassi,

2021) confirming that using the Blackboard for online education, especially during the COVID-19 pandemic, is beneficial for both students and teachers.

The UTAS has also signed a Memorandum of Understanding (MoU) with Microsoft and purchased email services and other educational applications from Google to facilitate online teaching in its branch campuses. The online classes are recorded and shared via Blackboard and these platforms for just-in-time learning. The departments of Mass Communication and Business Administration at the Salalah campus used Kahoot software for conducting interactive quizzes and surveys for introductory courses. New features like jamboard, short quiz and survey in the updated version of Google Meet enriched the class by making it more interactive and encouraging synchronous participation. The same facilities are used by the teachers to get feedback from their students.

The faculty members teaching courses involving mathematical and accounting calculations use digital graphic pads to explain the relevant concepts and problems, acting like a physical whiteboard. As a new approach during the pandemic, the university has approved its students to take a course in cutting-edge technology on any approved MOOC platform as equivalent to the six-week summer internship program.

***M-Learning***

Few of the courses used pre-developed mobile applications as supplementary materials for students learning specific courses in the foundation programme as well as some introductory courses (e.g. mathematics, English, and IT). The apps were using graphics and giving real world animated examples that facilitated the students to understand the concepts easily.

***Hybrid e-books***

The materials are given to students as e-books in many courses such as Oracle Fundamentals, Oracle PL/SQL, and programming, etc. The IT department prepared hybrid e-books (embedded with hypertext, audio and video player) and distributed them to the students. Hence the students can read the text and view the video and listen to the audio related to specific content whenever required. This helped them to get the complete e-learning experience although they were offline.

***Simulators***

The main issue faced by the teaching fraternity is to deliver the practical / lab classes for the students. There are some courses in the IT programme like ‘Network Management’ that require students to use multiple hardware and design a network.

These kinds of labs are conducted in a dedicated network lab in UTAS. However, the pandemic brought about a shift in the mode of teaching as the instructors started using simulators like 'packet tracer' to teach students network designing. This is also well received by the students as they got an opportunity to acclimatise and get real-time lab experiences. The images used in the simulator are very close to the actual device, making students feel that they are using a real time device.

The Zvork simulation software is beneficial for Mass Communication students to test the lighting effects during the photo-shoots and act as a virtual lighting studio. For digital studio-based courses, simulation using softwares like Virtual Lighting Studio allowed the learners to interactively light a portrait with multiple lights and see their combined effect, choose between simple bare strobes, ring lights, and / or soft boxes to model the mood of the portraits and find the appropriate lighting equipment.

***Augmented Reality***

The IT courses are required to use a few hardware devices during the lab session which need to be explained to the students by providing them real hardware devices like CISCO routers. However, the initial classes during the pandemic used videos recorded by the teachers to explain these devices. Progressively the augmented reality pictures help students to feel the 3D view of these devices.

***Free Open Source Software (FOSS) and Online Compilers***

Since 2015, the IT department has taken an initiative to move towards using FOSS as a lab tool for all the courses. The UTAS campuses started using FOSS instead of getting licensed paid software for the lab sessions of all the courses except Microsoft software. The cloud domination assists teachers to use online compilers which are convenient for the students and staff to use with minimum resources. The programming and database courses started using the online and cloud services extensively to teach the lab sessions. The students' also felt that online compilers are very convenient and can be used with very minimum available resources.

***Remote Screen controlling software***

Teachers are using remote device controlling software like 'Teamviewer' during the lab sessions. This helps them to view the students' desktops as well as helps the students to fix errors or proceed with their lab work corresponding to provide a feel of physical lab. 'Anydesk' application was also used for a similar purpose. For those instructors who want to share a screen for students or to work parallelly with another window, 'Dualless' software is a helpful platform splitting the desktop into two screens, instead of switching between the windows often. This software is beneficial for the instructors teaching accounting related courses by the Business Administration department.

## 6. Evaluation Process

The UTAS-Salalah is adapting assessment policies during the COVID-19 era to assess students' course work, tasks and all activities. The teachers conduct in-class quizzes using Google meet survey option. These results as well as the quiz options in the Blackboard and Google classroom are considered to confirm the students' participation. Many courses have allotted minimum marks for participation.

The students are motivated by the class participation marks and attend the classes regularly. This is evident by the fall in the forced withdrawal (FW) cases in these courses. The teachers have adapted to the Blackboard and Google forms for conducting interactive, and animative online quizzes. In addition, invigilation of exams is done by teachers either through Google Meet or Microsoft Teams.

The Blackboard has various features to conduct the exams securely. The assignments, case studies, reports, and students' projects are strictly collected via Blackboard using the 'Safe Assign' option. This gives the plagiarism percentage more accurate. The availability of the plagiarism report to students can be opted by the teachers in the settings. The teaching fraternity in UTAS-Salalah keeps the report visibility open for students for the draft copies. The plagiarism reports for the final copies are not visible for the students, but the students can check the similarity percentage before their submission.

The practical exams are conducted using simulators and cloud-based softwares. The exams are monitored using the 'Teamviewer' and 'Anydesk' applications. Apart from this, a viva voce is conducted to check the students' knowledge on their work. The presentations have been attended by a panel of evaluators from the same domain. The MOOC courses are offered to the students to make themselves familiar with online teaching and learning.
The online final exams are also conducted mostly through the Blackboard for both online and open book exams and invigilation is carried out via Google meet & Microsoft Teams platforms.

There are two invigilators along with a chief supervisor allotted for each exam to ensure that exams were conducted in a seamless manner. The marked exam papers are moderated by another teacher in the same domain before presenting the results in the results moderation meeting within the department. The final exam samples are collected and reviewed by the heads of the department (HoDs) and Programme Directors (PDs) before approving the results. All these strict processes are conducted online during this pandemic using the various digital platforms.

All the files were encrypted while sharing with others to avoid the leaking of the results and the exam works. The semester results are compared with previous semester results, proving that the assessment methodologies have reached a matured state and have generated a confidence that similar strategies can be employed in the following semesters to function in a progressive manner which match the objectives and learning outcomes of the courses.

## 7. Final Considerations

The COVID-19 epidemic has caused people to separate themselves from society to break the chain of disease spreading. Although most of the organizations of different products have been closed or reduced in functioning, public transportations and other communication modes have been shut down or reduced, and the educational institutions have been closed, the education to the learners of different ages has not stopped due to the cutting-edge technologies in telecommunication and internet. It became feasible also because of the contemporary online teaching methodologies and swift adaptation of the people to the changed mode of teaching and learning.

This study has revealed that the teaching fraternity in UTAS-Salalah has promptly adapted to digital transformation conditions, as the management provided suitable technological resources to the academic fraternity required for effective online teaching. The government in the Sultanate also supported the citizens to equip themselves for the online teaching mode. The internet service providers too came up with special offers for teachers and students to facilitate online education. Hopefully, this pandemic will leave a strong footprint in the field of education and alleviate our knowledge to develop new teaching pedagogies customised to the teachers-learners in Oman. In the recent conferences and symposiums also, it is witnessed that the teaching fraternity has been shifted to the digital mode during this pandemic.

The technological development will improve online teaching and learning to an advanced level. The UTAS-Salalah is considering the video analysing software to detect plagiarism in the forthcoming semesters, leading to making the assessment methodologies similar to their traditional counterparts.

These digital adaptations undertaken by the knowledge providers of UTAS-Salalah emphasise the significance of professionalisation of higher education policies, strategies and roles, while focusing on strengthening skill training for academics to equip them in the process of knowledge transfer. The UTAS-Salalah campus aims to meet the future requirements and challenges despite various uncertainties.

There is a need to strengthen and future-proof the HEIs to continue to transform and adapt themselves to meet future challenges, be it educational, societal and economic to utilise their role as a facilitator and knowledge disseminator to the society and the industry (European Commission, 2015). Thereby, it is essential to define a core set of needs, standards and goals for this digital transformational process based on the experiences gained from the teaching fraternity and the learners.

This would contribute to the policies and the future of the UTAS while ensuring synergies and coordination in the education field, through a participatory approach involving all the relevant internal and external stakeholders. This could also be achieved by transnational cooperation which would help in exchanging scientific knowledge while enhancing and adapting to the digital transformations in the field of higher education. It would also contribute to

accomplishing Oman Vision 2040 while moving towards a holistic transformation which integrates the local cultural flavour with international university standards.

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