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empower higher education

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The fifth Envisioning Report for Empowering Universities in the update of new modes of teaching and learning

We herewith present to you the fifth edition of the EMPOWER Envisioning report. The report is set up by the expert pools of the EMPOWER programme established by EADTU to cover the latest trends and developments in new modes of teaching.

The COVID-19 crisis has asked universities to make a rapid switch to digital education and re-organize their campus. With the EMPOWER Envisioning report we want to inspire fellow experts in innovating education by examples from practice. In this 5th edition we cover initiatives related to: *Digital Transformation in (post-) Covid Times (Chapter 1)*; *Innovating education by digitalisation and artificial intelligence (Chapter 2)* and *Integrating Short Learning Programmes (SLPs) and MOOCs in HE provision (Chapter 3).*

New modes of teaching and learning create new opportunities to enhance the quality of learning experiences on campus programmes, reaching out to new target groups off campus and offering freely accessible online courses. They enhance the quality, visibility and reputation of the institution.

The Envisioning report is a selection of good practices and studies done by the experts connected to EADTU's EMPOWER programme. They all work in all relevant areas for the development of new modes of teaching and learning. EMPOWER is further supporting individual universities by on-site expert seminars with free independent advice, onsite and online seminars, guidance for university leaders, expert panels for targeted reviews and, support for whole of institution initiatives. Please find the EMPOWER website, covering 13 expert pools, at: empower.eadtu.eu

The actual implementation of innovative methods in teaching and learning requires institutional strategies and frameworks. A strong motivation of a professional teaching staff and continuous commitment from the top management of a higher education institution is needed to make this a success. We are convinced the edition of the year 2021 is an inspiration for many to further innovate education and start cooperation and sharing of expertise with fellow innovators.

George Ubachs,
Managing Director EADTU

Digital transformation in (post-) COVID times

Teija Lehto and Kristiina Engblom-Pelkkala

Tampere University of Applied Sciences

Encouraging actions in tackling higher education pandemic challenges

Innovative impact

This article gives an encouraging example of how higher education policies and practices can adapt to totally unexpected paradigm changes in a short time.

The viewpoint of Tampere University of Applied Sciences (TAMK) in Finland, is likely to resemble the situation in many other European universities. The institutional Covid-19 pandemic emergency measures taken at TAMK represent the short-term impact, of which we already have collected some data and feedback.

The governmental educational pandemic support programs reflect the long-term impact expected on higher education in Finland. As these governmental support and recovery programs are largely based on the EU-based Covid-19 financial assistance to EU governments, the article can also prove to be useful in other European countries and higher education institutions.

Introduction

This article is based on information collected from actors in Tampere University of Applied Sciences (TAMK). TAMK Education Development Services has collected comments and feedback from their lecturers, educational and curriculum developers and students. The Covid-19 pandemic situation at TAMK is reflected from the point of view of the educational staff, as well as governmental emergency actions and nationwide development projects taking place in Finland.

Blended, hybrid and online education in the pandemic situation

At TAMK **blended learning** has been an integral part of the institutional strategy since the beginning of the millennium. Blended learning has an equal role besides **online learning** or **contact teaching**, and all these modes have been deeply embedded in the educational practices in our institution.

During the Covid-19 pandemic exceptional situation, since March 2020, blended learning suddenly appeared to be less in the focus than before. Instead, the concept of **hybrid learning** appeared in active use among TAMK teachers and educational support staff. The teachers at TAMK mainly seem to understand the hybrid learning as a setting, where the teacher has a face-to-face group in a classroom on the campus, and distance students online simultaneously. A demand for pure online learning has also inevitably increased due to the pandemic situation.

Nearly all teaching at TAMK shifted to online and distance mode when the Finnish Government declared a state of emergency in Finland over the coronavirus outbreak on 16 March 2020 (Ministry of Education and Culture, 2020). However, many of the laboratory assignments, and studies of the first-year students remained on the campus. The state of emergency ended in two months, on 16 June (Finnish Government, 2020).

Widened opportunities to develop online and hybrid teaching skills

Since the beginning of 2020 Tampere University and Tampere University of Applied Sciences (TAMK) constitute **the Tampere Universities community**. The staff from these two institutions cross-attend increasingly each other's staff training.

References

Digivisio 2030. (2021). *Korkeakoulutuksen digivisio 2030 – Suomesta joustavan opiskelun mallimaa.* https://digivisio2030.fi/

Digivisio 2030 application. (2020). *Digivisio 2030 – Hankkeen yleiskuvaus ja rahoitushakemus.* 15 Sept 2020. https://digivisio2030.fi/tiedostot/digivisio-2030-hankkeen-yleiskuvaus-ja-rahoitushakemus/

EXAM-consortium (2021). *EXAM – electronic exam software for higher education.* EXAM-consortium. https://e-exam.fi/in-english/

Finnish Government (2020). *Use of powers under the Emergency Powers Act to end – state of emergency to be lifted on Tuesday 16 June.* Government Communications Department. 15 June 2020. https://valtioneuvosto.fi/en/-//10616/valmiuslain-mukaisten-toimivaltuuksien-kaytosta-luovutaan-poikkeusolot-paattyvat-tiistaina-16-kesakuuta

Ministry of Education and Culture. (2017). *Vision for higher education and research in 2030.* Korkeakoulu- ja tiedepolitiikan osasto. https://minedu.fi/en/vision-2030

Ministry of Education and Culture. (2020). *Government, in cooperation with the President of the Republic, declares a state of emergency in Finland over coronavirus outbreak. Finnish Government.* 16 March 2020. Government Communications Department. https://valtioneuvosto.fi/en/-//10616/hallitus-totesi-suomen-

To mention a few of the typical types of staff training, TAMK is arranging **Moodle Masters studies**, comprising thirteen 90 minutes training sessions online, covering comprehensively various Moodle-related themes. Similarly, eleven different training sessions on **video and podcast technologies** were offered to the staff shortly after declaring the exceptional situation. Online training series on the technically monitored **EXAM electronic examination system** included four one-hour online webinars (EXAM-consortium, 2021). Taking part in these training sessions was highly recommended to the teaching staff, but fully voluntary.

In addition, teachers had initially the opportunity to receive **real-time online guidance** from online pedagogical support team every working day, Monday to Friday from 9 to 10 AM. As the emergency has gradually calmed down, the number of real-time online support sessions has been decreased to one session per week.

The Tampere Universities community has arranged online trainings focusing on how to quickly transform existing contact teaching to online learning, how to flexibly leap to a pandemic mode of teaching. The recordings of these training sessions are available for all the Tampere universities community staff. Additionally, full-day or half-day training sessions on various Microsoft tools or social media apps are provided by a commercial partner company.

The portfolio of staff training related to blended and hybrid learning appears to be well-aligned considering the rapid pandemic change of the teachers' professional landscape.

Sharing digital education practices

TAMK has a few established ways to share the educational practices between its staff members. **TAMK conferences** are organized annually. Practically no presenters, keynote lecturers or even attendants come from outside to this conference. Selected presentations are collected into a TAMK Conference printed publication. In February 2020 the TAMK conference was organized in a traditional face-to-face manner, but in 2021 the conference went online.

TAMK **Staff Days** are usually arranged four times a year. Besides the management sharing the latest organizational information, a case or two of the best teaching and digital learning practices usually fit into the program. **TAMKjournal (2021)** in an open access web journal focusing on research, development, innovation, and education. The journal also shares best educational practices to some extent.

Tampere Universities community has a network of **Digimentors**, who are teachers mentoring their peers in the same school, faculty or team. A digimentor is the first point of contact, when a pedagogical approach to a blended, hybrid or online learning issue is required. Digimentors are close enough professionally to their peers. The digimentors maintain a Digital Toolkit which is available for anyone (Tampere Universities community, 2021).

olevan-poikkeusoloissa-koronavirustilanteen-vuoksi

TAMKjournal (2021). *TAMKJournal: An open access journal that highlights Tampere University of Applied Sciences' operation and expertise.* Tampere University of Applied Sciences. https://tamkjournal-en.tamk.fi/

Tampere Universities community. (2020). *Digital Toolkit.* https://sites.tuni.fi/digitaltoolkit/

Valtioneuvosto. (2020). *Korkeakouluopiskelijoiden hyvinvointia ja ohjausta tuetaan erityisavustuksilla*. 14 Oct 2020. Finnish Ministry of Education and Culture. https://valtioneuvosto.fi/-/1410845/korkeakouluopiskelijoiden-hyvinvointia-ja-ohjausta-tuetaan-erityisavustuksilla

Digimentors

Digimentors at the Tampere universities community are teachers mentoring their peers in questions of digital education.

https://sites.tuni.fi/digitaltoolkit/digimentors/

Governmental policies and programs

Blended education is regarded as one of the standard modes of implementing education in Finland. **The vision for the Finnish higher education and research in 2030** paper was published by the Ministry of Education in October 2017. (Ministry of Education and Culture, 2017).

The current government in Finland has launched a **Digivisio 2030 project** based on the vision paper (Digivisio 2030, 2021). These initiatives focus on digital education in all its forms and modes. To give an idea of the extent of the investment in digital education in Finland, the budget of the Digivisio 2030 project is about 120 million euros for the timespan 2020-2040. (Digivisio 2030 application, 2020).

Well-being of students

It evidently is a wrong assumption that all students have an easy access to proper IT systems, and they have broadband connections. The pandemic situation is a challenge for many students. Finnish Government has on 14 Oct 2020 announced a special grant that is aimed at universities, student organizations, student unions, student unions and actors within the administration of the Ministry of Education and Culture, whose main goal is to promote the well-being of university students. The grant can be used, for example, to alleviate the students' experience of loneliness, to develop support activities or strengthen community spirit. (Valtioneuvosto, 2020.)

Conclusion

As the Covid-19 emergency started in the middle of March 2020, universities were practically ordered to switch to online and distance mode in Finland. The shift was based on the emergency legislation. Although the state of emergency has legally ended, the distance and online mode seems to continue at least until August 2021.

The Finnish Ministry of Education is making a significant investment in digital education with their Digivisio 2030 project and the related vision paper. The significance of physical campuses and spacious university buildings will be further questioned after the Covid-19 situation. We have experienced that working and studying in the distance and hybrid modes is a real option for an increasing number of people.

Dr Inma Álvarez, Dr Azumah Dennis, Dr Philippa Waterhouse

The Open University, UK

Researching from home. Doctoral research in a pandemic

Innovative impact

Due to the COVID-19 pandemic, higher education institutions have faced the challenge of a rapid rethinking of the training provided in their doctoral programmes as well as the social support offered to doctoral researchers. Doctoral researchers need different skills to do research under lockdown conditions as well as to reconsider the design of their research projects. In this context, we have not only seen internal adjustments by individual universities, but also a rapid raise of sharing of online reflective narratives, conferences, social media conversations and curated content on researching during a pandemic.

The following are examples of efforts made in the UK to help transitioning research activity to an online setting.

Doing qualitative research on inequalities during Covid by the University of Sheffield.

Digital Ethnography Collective by London School of Economics.

Methods LAB by Goldsmiths, University of London.

Research during the pandemic by the University of Edinburgh

In the future, examples like these of curated research advice could be promoted not only at an institutional level but also among doctoral supervisors and students around the world.

Introduction

Mid-March 2020 saw the closure of the majority universities across Europe in response to the COVID-19 pandemic (Council of Europe, 2020), whilst social distancing and travel restrictions in a large number of countries have had a continued impact on research activities. The impact of COVID-19 on doctoral researchers is complex, depending on individual circumstances, stage and nature of research projects as well as discipline.

In the United Kingdom (UK), the public body UK Research and Innovation advised all funded doctoral students "to adapt and adjust research projects to mitigate the delays caused by COVID-19" (UKRI, 2020). Suddenly researchers found themselves rethinking data collection methods, research questions and participants. More recently, the UK Council of Graduate Education indicated that this situation has raised questions about meeting the required standard for an award (UKCGE, 2021). Indeed, this reframing activity has caused concerns amongst postgraduate researchers about the time lost, the shift of the research focus to a new area, and the ethical impact on studies in certain disciplines, for instance, those with participants working in sectors heavily impacted by the pandemic such as health and education. The unexpected shift to researching from home is a unique opportunity for rethinking research in digital spaces and at a distance, growth of reflexivity as well as the use of innovative research practices.

This article focuses on how the research plans of doctoral researchers have been disrupted during the COVID-19 pandemic. We examine, in particular, how the restrictions have affected postgraduate researchers in the UK with respect to their study-life balance, the shaping of their project designs, and their evolving research communities. We also discuss how institutions can support these novice researchers right now but also in future with the use of available technologies.

Disrupting the researcher and the research

Doctoral researchers' study-life balance

Researching from home, almost inevitably, means blurring boundaries between the professional and the personal; with research studies family life and, for many, work responsibilities all occupying the same physical space. For some doctoral students, changing work and family contexts, for example home-schooling, increased employment strains or hours, and increased care needs of family members shielding, has had significant consequences for both their time availability for academic study and an unavoidable impact on their individual wellbeing.

In the UK 43% of those enrolled in postgraduate research degrees in

References

Castello, M., Pardo, M., Sala-Bubara, A. & Sune-Soler, N. (2017). Why do students consider dropping out of doctoral degrees? Institutional and personal factors. *Higher Education*, 74, 1053-1068.

Gardner, B. (2020). Challenges of Doing Research in a Pandemic: Reframing, Adapting and Introducing qualitative methods. *International Journal of Social Research Methodology*, The Editors Notebook, 17 June. https://ijsrm.org/2020/06/17/challenges-of-doing-research-in-a-pandemic-reframing-adapting-and-introducing-qualitative-methods/

Goldstein, R. S., Vasques, R. A., Cecilia, M., & dos Santos, L. (2020). Doing design research with youth at/from the margins in pandemic times. *Researching in the Age of COVID-19, Volume III: Creativity and Ethics*, 112.

HESA. (2020). *Who's Studying in HE?* https://www.hesa.ac.uk/data-and-analysis/students/whos-in-he

May, T. & Perry, B. (2017). *Reflexivity the essential guide*. SAGE Publications.

Offerman, M. (2011) Profile of the nontraditional doctoral degree student. *New Directions for Adult & Continuing Education,* 129, 21-30.

Stachl, C.N. & Baranger, A.M. (2020). Sense of belonging within the graduate community of a research-focused STEM department: Quantitative assessment using a visual narrative and item response theory. *PLoS ONE,* 15(5).

2019/20 were aged thirty years or older (HESA, 2020) and are more likely than those at other stages of their higher education studies to have a range of personal commitments and responsibilities that are on-going during the course of their studies such as parenthood, employment and unpaid care roles (Offerman, 2011). Difficulties or stress resulting from balancing academic studies with work, family and personal lives are frequently cited as a contributory factor for poor wellbeing or intentions to withdraw (e.g. Castello et al. 2017; Sverdlik et al. 2018). The circumstances described during the pandemic intensify what was an already challenging context.

Higher education institutions are having to acknowledge more explicitly these pressures and provide support to minimise impact on doctoral studies. For example, at The Open University in the UK, previously, doctoral students were only permitted study breaks on the grounds of certified ill health, employment related difficulties (intensification of workload) and maternity, paternity and adoption leave. However, domestic commitments are now being recognised as valued reasons for disruption of study or extension requests during the pandemic. Moreover, if the need for a study break is directly attributable to COVID-19, it is not counted as part of the regulatory entitlement and students may take as much time off their study as their circumstances require. In our institution, there has also been an ethical change in a previous restriction to part-time students accessing counselling services – any doctoral researcher can now make use of this valuable online support when struggling for their competing demands.

Redesigning the research

Universities have advised doctoral researchers to revise their research plans with social distancing restrictions in mind. The shift from doing face-to-face fieldwork to researching remotely from home has required greater reflexivity from doctoral researchers. Reflexivity "constitutes a process of meta-learning – not only reflection in but on action" (May & Perry, 2017), and this is exactly what postgraduate students have been forced to do. For instance, in her notebook entry for the *International Journal of Social Research Methodology*, Bea Gardner (2020) reflects on the process of reframing, adapting and introducing new methods in her PhD research. Her considerations from the initial postponement of researcher data collection to the reframing the focus of her research to increase its relevance in covid-19, and to adapting her methods to be remote and introducing new ones represent the uncomfortable "reflexive messes" (May & Perry, 2017) arising for researchers from the current social reality.

In the past year, digital environments have helped redefine postgraduate research practices. In addition to data generating technologies – conferencing software for synchronous interviews or focus group discussions, digital (audio or visual) diary for researcher reflections (Gardner, 2020), or research participants self-reporting (Goldstein et al., 2020) instant messaging, online surveys – doctoral researchers are making use of data already digitally available such as blogs, websites, social media discussions and other open access resources and available secondary datasets. A wealth of resources has

Sverdlik, A., Hall, N.C., McAlphine, L. & Hubbard, K. (2018). The PhD experience: A review of the factors influencing doctoral students' completion, achievement, and wellbeing. *International Journal of Doctoral Studies*, 13, 361-388.

UKCGE. (2021). *Covid-19 Impact on Assessment of Research Degrees*. http://www.ukcge.ac.uk/article/impact-covid19-assessment-doctoral-degrees-474.aspx

UKRI. (2020). *Policy Statement. UKRI Covid-19 Phase 2 Doctoral extension funding policy*, November. https://www.ukri.org/wp-content/uploads/2020/11/UKRI-11112020-COVID-19DoctoralExtensionsPolicyPhase2PolicyStatement.pdf

Wang, L. & DeLaquil, T. (2020). The isolation of doctoral education in the times of COVID-19: recommendations for building relationships within person-environment theory, *Higher Education Research & Development*, *39*(7), 1346-1350.

been developed to support researchers successfully adapt and design remote research, such as the COVID-19 resource collection by the National Centre of Research Methods. In fact, it could be argued that one of the implications of researching in a digital world could be the emergence, institutionalisation and stabilization of more researcher-centred technologies which may facilitate more inclusive research. Already in 2015 the OU in the UK launched OpenSTEM Labs, an internet-based laboratory, including on-screen interactions, for science research at a distance. This kind of initiative led by a distance education university could inspire digital innovation for research and could revolutionised the training of doctoral researchers around the world.

Sense of belonging to a research community

Social distancing has not only affected fieldwork of doctoral studies, but also their study experience through closure of universities. Wang and DeLaquil (2020) have highlighted through the lens of person-environment theory, that researching from home has displaced the 'indispensable' interpersonal relationships of the doctoral student experience to the virtual environment. This interpersonal dimension is key for our sense of belonging and lack of it can affect our wellbeing, but there has been little research on the sense of belonging in graduate communities (Stachl and Barager, 2020).

The closure of the OU's Milton Keynes campus as a result of the pandemic moved all regular research-related activities online. Mindful of the importance of interpersonal relationships, in addition to running online research training the Graduate School at the OU has adapted previous social opportunities such as the 'Bake Your Research', 'Take Away Tuesdays', weekly 'Coffee Mornings' and an annual residential to take place remotely, as well as creating new opportunities for social interaction such as a dedicated Microsoft Teams spaces, Wellbeing (mindfulness) sessions, and Student led Saturday seminars. Faculties across the university have created other digital events, such as the *Research re(imagined): (Post)pandemic perspective* conference for and organised by doctoral researchers in the Faculty of Wellbeing, Education and Language Studies.

Conclusion

The disruption in doctoral research arising from the COVID-19 pandemic discussed in this paper has had a direct impact on doctoral researchers' wellbeing, fieldwork mobility and universities' management of the doctoral programmes. We see a long-term change in postgraduate research education occurring, including one that supports hybrid interaction, both online and face-to-face, in both training provision and research. Successful change not only depends on adaptation by individual institutions but also on shared knowledge and resources among them. Furthermore, in post-pandemic times, some of the new configurations of personal/study/work life will remain, therefore, institutional measures for doctoral researchers' general wellbeing under these conditions may need to become a permanent feature, including increased flexibility in study arrangements and enhanced online services.

Andy Lane

The Open University, United Kingdom

Training higher education staff in online, open and distance learning at scale

Innovative impact

Most projects to enhance distance education involve staff from a single higher education institution (HEI). The distance education provision in Myanmar involves 40 HEIs in one country. TIDE devised a model for training university staff and of training the trainers to ensure wide and deep impact across these HEIs.

The programme involved a diversity of staff and used the team-based development of open educational resources as the main vehicle for putting learning into practice. This professional development programme was supported by several other strands of work on employer engagement, change management and HE strategies.

First the pandemic, then the coup have severely disrupted the longer-term impact of TIDE interventions as HEIs are not currently functioning with both students and staff not allowed on to campuses. A substantive set of self-study legacy resources have been curated and made available on OpenLearn Create that can be used by HEIs and their staff in Myanmar (and potentially by similar projects in other countries) as and when they are able to do so.

Introduction

The Covid pandemic has forced many Higher Education (HE) staff to pivot to some form of remote online teaching. This has largely involved lone teachers adapting their largely synchronous, classroom-based teaching to a mix of synchronous and asynchronous teaching online teaching using technologies provided by their Higher Education Institution (HEI). Distance education (DE) is largely predicated on teams of academics and learning technologists designing and developing mostly asynchronous teaching materials/learning experiences that can be studied by hundreds and thousands of students at a time. This paper briefly explains how the Transformation by Innovation in Distance Education (TIDE) project has trained several hundred HE staff from 40 HEIs in Myanmar's DE system as it transitions from a centralised to a distributed model (Gregson, Lane and Foster, 2019; Lane, 2020) and at the same time reacted to Covid.

Background

Myanmar has a unique DE system that encompasses 40 different HEIs under the control of the Ministry of Education teaching around 60% of all HE students (Lane, 2020). There are two Universities of DE, Yangon in lower Myanmar and Mandalay in upper Myanmar, that are responsible for developing the printed teaching texts and some audio-visual material that the students have to study. Some tuition, assessment and pastoral support services are provided to these part time students through regional Arts and Science Universities and Colleges, which also teach full time campus-based students (hence also known as day campus universities). The syllabi for degree programmes are set by national committees and are in very traditional disciplines. The division of labour between these HEIs means few HE staff are involved in producing open, online or distance education resources or in developing broader disciplinary knowledge and skills. Staff are also regularly transferred between HEIs meaning that roles and responsibilities change frequently. A culture of didactic teaching, rote learning and teaching to the test (examinations) has pervaded these HEIs for many years with limited use of technology to support or enhance teaching and learning (Lane and Gregson, 2019).

The TIDE project, funded by UK Aid from the UK Foreign, Commonwealth and Development Office, worked between 2017 and 2021 in devising and delivering a number of interventions to help improve the nature and quality of this DE system. Led by The Open University it also involved Oxford University and the University of Manchester to provide most of the environmental science elements.

References

Gregson, J., Lane, A. and Foster, M. (2019) Adaptive Project Design: Early insights from working on transformation of the Distance Education System in Myanmar, Paper presented at PCF9, Edinburgh September 9-12

Gregson, J., Pitt, R. and Seal, T. (2019). Developing a Digital Strategy for Distance Education in Myanmar. Paper presented at PCF9, Edinburgh September 9-12

Lane, A. (2020) In G. Ubachs (Eds.) Developing capacity for openness in a national Distance Education system, The Envisioning Report for Empowering Universities. pp. 6-8. Maastricht, NL: EADTU.

Lane, A. and Gregson, S. (2019) Fostering innovations in pedagogical practices: transforming distance education through a professional development programme using OERs, paper presented at PCF9, Edinburgh September 9-12

One significant strand of TIDE involved the provision of a professional development programme to train HE staff in open, online and distance education principles and practices using Education for Environment and Sustainable Development as the subject theme.

The professional development programme

As noted in Lane (2019) the two-year TIDE professional development programme involved 40 HEIs and over 300 staff. Originally this was to be done through three overlapping cohorts, the first cohort of 60 academics and 40 ICT, Library and support staff from 10 universities started in May 2018, the second cohort of 86 academics and 40 support staff from 11 further universities started their programme in May 2019, with a third cohort of 72 academics 47 support staff and due to commence their programme in May 2020, but this was impacted by Covid restrictions. The academic staff from each HEI came from different disciplines while the ICT, Library and other support staff were very diverse in the roles they performed.

The original two-year programme had parallel strands for academic staff and support staff. Academic staff would undertake a mix of academic knowledge-led (environmental science) activities and teaching and pedagogy-led (open and distance educational practices) activities; while the support staff would undertake educational technology-led activities (open licensing, online learning platforms, media production etc.). These activities were to be centred on four in country 5-day residential schools accompanied by a series of intervening training and development events between these schools (namely webinars, online courses and face to face seminars). Each residential school involved up to 12 UK based tutors while webinars and in country seminars were given by yet more staff. Around 40 UK based tutors from the three UK universities have contributed to some part of these professional development programmes.

Whereas all the events dealt with developing knowledge and skills, these were put into practice through another strand of activity - the co-development of OER dealing with environmental subjects – where mixed teams of academic and support staff pooled their expertise and skills to produce educational materials that they will be able to incorporate into their own teaching programmes.

In the end, only the first cohort completed the full two-year programme, the second cohort were halfway through theirs and the third cohort never started theirs due to Covid travel restrictions. This meant that we had to devise a fully online, remote, cut down version of the professional development programme highlighted in the second figure shown below. These revised programmes, using in country mentors from the first cohort led by UK tutors, were launched in late 2020 but they were also curtailed by the Military coup in early 2021.

In addition, we also reworked 4 existing free, online courses from The Open University for self-study by any university staff in Myanmar and provided opportunities for more in-depth study for a smaller cohort of around 20 staff.

Training of trainers

A key feature of all the TIDE professional development programmes has been the sharing of knowledge and skills and the creation of a cadre of trained staff who can then train more staff. Many participating staff undertook cascade training to colleagues back in their universities, usually soon after each residential school. We instigated training sessions for some staff, particularly from the first cohort, initially for co-tutors and then co-mentors as we tried to adapt to the in country Covid restrictions.

Conclusions

While the focus of TIDE was on transforming DE, the original professional development programme was primarily delivered in the classroom. The lack of experience of creating DE materials amongst staff as well as their limited digital capabilities within a developing ICT infrastructure, meant that online components of the programme were kept to a minimum and integrated into other activities. The mixing of staff and a string focus on team working helped induce a sharing ethos supported by the rectors of the HEIs. And the focus on educational practice in general and good DE in particular provided general upskilling of the university workforce; while the focus on open educational resources and practices encouraged cross HEI as well as within HEI collaboration (Lane, 2019).

The pivot to online provision had the weakness of focussing on individual study rather the team working but had the strength of forcing everyone to adapt to online modes of studying and working. The minimal use of technology to support or enhance learning in Myanmar meant that TIDE was faced with trying to take staff from a low to a very high sophistication in terms of educational practice with the expectation that online learning would take some time to develop in Myanmar as the digital infrastructure took time to develop (Gregson, Pitt and Seal, 2019). The pandemic has shortened this expectation although the coup has lengthened it. TIDE did also survey student readiness for online study and found that, as with staff, digital capabilities and digital access were poor, although yet again the pandemic (and coup) has made online study almost the only mode currently available.

The TIDE team was not able to complete all its interventions to the scale and intensity as originally planned. Nevertheless, it has given many staff an many universities a taste of what it is possible to do to transform teaching and learning practices in Myanmar and to experience for themselves what it can be like to study at a distance and to study online. While the project has had to end four months earlier than planned we are leaving behind a substantive body of legacy resources arising from the project including most of the resources used for the two-year classroom based and subsequent nine month online based programmes alongside many other resources. It is to be hoped that these resources will be drawn upon in the future once the future of the DE systems and its constituent HEIs becomes clearer.

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UNED

eLearning and Distance Learning Differences

Innovative impact

This paper's most crucial innovation distinguishes between the concepts of 'eLearning' and 'Distance Learning' because most people consider them the same thing, but they are two separate entities. This paper studies and compares the benefits of both methodologies as responses to COVID-19 in education.

eLearning is a learning style, while distance learning is a method of attending class even if it cannot be physically in the class. eLearning aims to create online communication between the teacher and the student.

Distance learning is about the distance between the student and the teacher and how technology and course materials bridge that gap. It is of the most important relevance for a student or teacher to know the differences between these two methodologies when choosing the right course to follow or teach.

Introduction

We can find the origins of distance education in 19th-century correspondence schools in the United States of America. In Europe, mail-order courses started in the middle of the 19th century. During the first half of the 20th century, educational technology in the United States was influenced by two developing schools of educational philosophy, with behaviourism concentrating on altering student behaviour and constructivism focusing on the process- and experience-based learning.

The first technological aide to education was the lantern slide followed by tinfoil phonograph in 1877, university-owned radio stations, and films for the classroom. Instructional television courses, and experiments in computer-based education, began in the 1950s. The next significant advancement in educational technology came with linking computers through the Internet, which enabled modern distance learning development.

Modern distance learning courses employ Web-based course-management systems Web-based services. The courses include digital reading materials, podcasts, e-mail, threaded (linked) discussion forums, chat rooms, and test-taking functionality in virtual (computer-simulated) classrooms. Web-based services include e-tutoring, e-mentoring, and research assistance. Figure 1 summarizes the evolution of distance education.

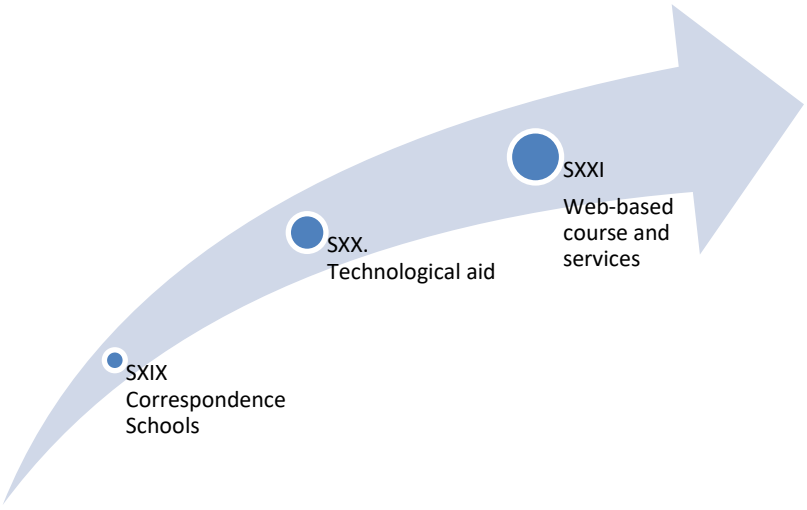

Figure 1. Distance education evolution

References

Digvijay et al. 2021. Mental Stress in Online Learning During the Pandemic: An Assessment of Learners' perception. *Asian Journal of Advances in Research, 6(3): 37-49.*

Simonson, Michael and Berg, Gary A.. "Distance learning". *Encyclopedia Britannica*, 7 Nov. 2016, https://www.britannica.com/topic/distance-learning. Accessed 6 April 2021.

Resources

https://en.unesco.org/covid19/educationresponse

https://educationonline.ku.edu/community/distance-education-evolution-in-2020

https://www.techsmith.com/blog/distance-learning/

https://nsuworks.nova.edu/tqr/vol3/iss3/1/

https://elearningindustry.com/differences-between-elearning-and-distance-learning

https://www.inc.com/jessica-stillman/class-central-best-online-courses-2020.html

https://kajabi.com/blog/10-unconventional-online-course-ideas-in-high-demand-right-now

http://oasis.col.org/bitstream/handle/11599/29/KS2007_Adapting-Learning-Materials.pdf?sequence=1&isAllowed=y

https://hbsp.harvard.edu/inspiring-minds/how-to-teach-any-business-case-study-online?cid=organic-social%7Cfacebook%7Cteach-any-case-

Distance education and eLearning

So far, we have reviewed the origins of distance education. However, are distance education and eLearning the same thing? 'eLearning' and 'Distance Learning,' which are usually considered interchangeable concepts, are two separate entities. The following lines will permit the learner and teacher to see the differences between the two.

According to the British Encyclopaedia (in Latin The *Encyclopædia Britannica)*, four characteristics distinguish distance learning:

1. It is, by definition, carried out through institutions; it is not self-study or a non-academic learning environment.
2. Geographic separation is inherent in distance learning, and time may also separate students and teachers.
3. Interactive telecommunications connect individuals within a learning group and with the teacher.
4. Establishes a learning group, sometimes called a learning community, composed of students, teachers, and instructional resources.

It can also be added or summarized that distance education facilitates communication between teachers and students and between students by removing the *distance and time* constraints associated with sharing information in traditional classrooms or during instructors' office hours. Technology and organization bridge the gap.

eLearning is a form of learning designed to create online communication between the teacher and the student, and many universities are now using eLearning to complement the learning done in the classroom. eLearning is used in local settings, so distance is not a determinant variable.

The question of time is different. Synchronous distance education refers to a method of education delivery that happens in real-time. It requires live communication online and uses technology to achieve this.

In asynchronous distance education, students have the freedom to work at their own speed. Students can access course content beyond the scheduled meeting or class time. Interaction through online conversations, quizzes, or video comments is their own decision.

Faculty and students could benefit from the flexibility of asynchronous learning because it allows them to use or create the course content when it is convenient for them.

Of course, eLearning could combine synchronous and asynchronous methods. The fact is that distance learning allows to do without synchronous activities, and that is why it is the feature that best allows differentiating this type of course from those of eLearning.

online%7Cnone%7Cinspiring-minds-article%7Cunknown%7Cinspiring-minds-article%7Cjan2021

https://www.niu.edu/citl/resources/guides/instructional-guide/blended-and-distance-learning.shtml

Conclusion

According to the British Encyclopaedia by the beginning of the 21st century, more than half of all two-year and four-year degree-granting institutions of higher education in the United States offered distance education courses, primarily through the Internet. With more than 100,000 different online courses to choose from, about one-quarter of American students took at least one such course each term.

Due to the arrival of COVID-19 distance learning has changed from an attractive option to a necessity. More than 1.5 billion students, or 91.3 percent of global enrolments were directly affected by school closures at the height of the COVID-19 outbreak in early April (UNESCO 2020).

However, online learning in itself is not without grey areas. UNESCO would say that students find a hard time to cope with the demands of online learning. As a result, they often end up in deep anxiety just to meet their online academic requirements (Digvijay 2021).

Distance education and eLearning are methods of learning that could help learners wherever they are. However, mental stress can be aggravated by the student's frustration at choosing a course other than the desired one.

Most students understand distance education as a substitution of their activities in person with the others done virtually. For someone enrolled in a typical distance course, the feeling of frustration and abandonment can be enormous. On the other hand, a typical remote education student, for example, a worker of a company, enrols in the classic eLearning course, frustration and anger are usually not minor. For these reasons, it is essential to be very clear about the difference between the two types of courses.

Ormond Simpson

Following the Money - Costs and benefits in online learning

Innovative impact

This paper argues that the future of online learning will largely be driven by economic considerations. Consequently it will be vital for the future of online learning that:

1. Administrators of online learning take steps to understand the relationships between the costs and benefits in their organisation.

2. Online institutions take steps to improve the efficiency of the output of their 'product' – i.e. graduates - so that it is competitive with the output of conventional education institutions.

As Professor Fred Lockwood writes:

'It's alarming that despite the billions of dollars spent every year, many teachers, managers and administrators in online learning have little or no idea of the costs and cost structures associated with the assembly and delivery of online materials'. *(Foreword to 'Economics of Distance and Online Learning, Bramble and Panda, Routledge 2008)*

To improve this situation administrators and managers will need to understand economic concepts such as 'Investment risk' 'Resale value of qualifications' 'Return on investment' and 'Willing to pay'.

Costs and benefits in online learning

A new OECD report out in 2020 'Resourcing Higher Education' focuses on the cost of online learning. It notes that 'contrary to expectations, many digitised courses have had comparable costs to in-person instruction…. online teaching is just as expensive as in-person instruction.'

If this is true then this is a considerable threat to the development of online learning. But is it true? And is it possible to apply a cost-benefit analysis to online learning?

Is distance education as expensive as convention education?

The OECD report's argument that online education is as expensive as conventional education is based on a relatively small scale study conducted last year at the University of North Carolina. This found that developing digital courses was actually slightly more expensive than creating on-campus ones, because lecturers needed smaller class sizes than on campus to keep students engaged. In other words in order to get the *same output* of successful students from an online course as from a conventional course, relatively more input was needed from teachers. This was what made online courses as expensive, or even more expensive than conventional ones.

While this was a small scale study, it agrees with long-standing findings from Rumble (2004) and Hulsmann (2000).

Cost and benefits for governments, online educational institutions and online students

There are three 'interested parties' involved in any cost-benefit analysis of online learning in any country – the national government, distance institutions in the country and, of course students, both actual and potential.

1. Governments

National governments recognise the value of increasing the number of graduates in their population. Such increases have pay-offs not just in terms of increased economic growth, but in terms of better health, longevity and even in the amount of volunteering in society.

At the same time governments will want to increase their graduate numbers as economically as possible. Hitherto many governments have seen distance learning as a more inexpensive method of

References

Hulsmann, T. (2000) Costs of Open Learning: a handbook. Verlag, Bibliotheks und Informations system der Carl von Ossietsky Universitat, Oldenburg

OECD (2020) 'Resourcing Higher Education' https://www.oecd-ilibrary.org/education/resourcing-higher-education_735e1f44-en

Rumble, G. (2004) 'E-Education – Whose Benefits, Whose Costs?' chapter in 'Papers and Debates on the Economics and Costs of Distance and Online Learning' ed. Rumble in no. 7 of the series 'Studien und Berichte der Arbeitsstelle Fernstudienforschung der Carl von Ossietsky Universitat, Oldenburg' Germany.

Simpson, O. (2004) 'The impact on retention of interventions to support distance students': Open Learning, 19 (1)

Simpson, O. (2005) The costs and benefits of student retention for students, institutions and governments'. Studies in Learning Evaluation Innovation and Development (Australia) 2 (3)pp34-43 http://sleid.cqu.edu.au/viewissue.php?id=8

Simpson, O. (2013) 'Supporting students for success in online and distance education'. Routledge, New York ISBN 978-0-415-50910-7 https://www.routledge.com/

Further Reading

'Cost benefits of Student Retention Policies and Practices', chapter in *'Economics of Distance and Online Learning'* ed. Bramble and Panda. Pub. Routledge ISBN978-0-415-96389-3

increasing the number of graduates in their population than conventional higher education. The OECD report suggests that *for equal graduate outputs* this is not true. The only way that online learning can produce the same yield of graduates as conventional education is if it employs greater numbers of teachers, thus bringing up its cost to the same level. This may well decide where governments choose to focus their resources in future.

2. Distance institutions

So in order to flourish distance institutions need to find ways of at least levelling their costs with conventional institutions, if not actually improving over them. They will only do that if they are able to get a tighter understanding of how their expenditure affects their output of successful graduates. In particular they will need to know how to focus their spending to obtain the biggest graduate numbers for the smallest expenditure.

But equally they will need to know how to fund that expenditure. That in turn will depend on how they are being funded. There appear to be three main models of funding:

i. Institution A - direct block grant from government based on the number of students

ii. Institution B - grant from government depending on the previous number of successful students

iii. Institution C - student fee income

– with arrangements that are a mix of two or more models.

Whichever funding model applies to a particular institution the basic cost analysis is the same. For example, an institution could apply a particular retention-focused activity to its students costing €c per student. If that is applied to N students then the total cost of the activity is €cN. If that activity produces an increase of n% in retention then the total number of extra students retained is nN/100. Thus the activity cost per extra student retained is €[cN/(nN/100)] = €[100c/n].

To take a real example (Simpson 2004) a phone call costing €12 was made to a group of around 2000 students which resulted in a retention increase of approximately 4% in that group over a control group. In this case the cost per student retained was therefore 100x12/ = €250. The effect then depends on the funding model of each institution:

i. Institution A just needs to ensure that this sum is equal to or less than the block grant per student in order to stay in business or improve its financial standing.

ii. Institution B needs to be sure that this sum is equal to or less than the government grant per previously successful student. In the case of the UKOU up to twenty years ago this grant was of the order of €1500pa, so that this one activity had a return on investment of 1500/250 = 600% which made it very easy to argue for the mainstreaming of the activity.

iii. Institution C has a more complex calculation to make involving the extra fee income from the extra number of students carrying on to the next module. That fee will be determined by other things such as the need to compete with other

institutions, but again in the case of the UKOU I estimate that there is still a positive return on investment (Simpson, 2005).

3. Online Students

The financial analysis for online students is equally important. Every potential online student thinking about investing into distance education should, in theory, be considering concepts such as:

i. *Investment risk* – what is the risk to my investment of time and money? That risk is of course the risk of dropping out, which is currently higher than in conventional education. (Simpson, 2013) So although the initial course fee may be less than for a conventional course, the risk of losing it is much higher.

ii. *Resale value of the qualification* – how valuable will my qualification be in financial terms? Will it lead to employment that is sufficiently well-paid to help repay any loans that I may have taken out to pay the fees? For example in most countries degrees in law and economics typically have higher resale value than degrees in the arts or social sciences. But that can change not least because the laws of supply and demand may operate differently in a post-Covid world.

iii. *Return on investment* – taking into account the investment risk and the resale value of the qualification, will the return on my investment be worthwhile?

iv. *Willing to pay* – having calculated the risk, resale value of my proposed qualification and eventual return on my investment, am I willing to go ahead and how much am I willing to pay?

Of course it's probable that no student has ever consciously worked through these stages to make a decision about taking a distance education course. Nevertheless, whether consciously or unconsciously, these considerations will affect the way students choose their learning and ultimately the future of online education.

Conclusion

The future for online educational institutions will increasingly be driven by economic considerations. But few online institutions appear to have a clear understanding of the relationship between their financial decisions and their output of their 'product' – successful graduates. Yet economic drivers have a habit of winning out in the long run and institutions who ignore that may find it increasingly difficult to maintain their financial standing and existence. It's time for researchers into online learning to turn their attention to money – how online institutions get it, how they spend it and what returns they get for it. In other words it's time to Follow the Money in online education.

Innovating education by digitalisation and artificial intelligence

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Artificial Intelligence and Learning Activities

Innovative impact

This chapter outlines an AI Pedagogy Planner combining six suggestions of learning activities with eight types of AI applications that may be used by instructional designers.

We contend that the decision support tool based on a picker wheel approach to AIED could be used in practice by instructional designers to facilitate pedagogically based decisions in the process of building the curriculum in higher education.

Educators should lead AI. Educators should not be led by AI.

Introduction

The purpose of this chapter is to discuss the pedagogical applications of artificial intelligence in higher education and to answer the overall question: how AI applications may support specific online 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 may be connected to 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 Rogarten et al. (2018), Rienties et al. (2020), Simonsen (2020a), and it is definitely about time that we discuss potential pedagogical approaches to artificial intelligence applications in higher education. The analysis of the cases used in this paper are related to the question raised. We will try to answer that and propose a conceptual discussion of how elements from the ABC Learning Design Approach (Young & Perovic, 2016) may 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), Holmes (2019a) and Holmes (2019b).

AI Applications in Higher Education

Existing literature does not fully discuss the potential associations between AI applications and 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 indicating which type of AI application can be used to support a specific learning activity. 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.

The overall classification of learning and artificial intelligence we

References

Bidarra, J., Holmes, W., & Simonsen, H. K. (2020). Artificial Intelligence in Teaching (AIT): A road map for future developments. In *Empower EADTU*. https://empower.eadtu.eu/events/repository (Accessed 5 September 2020)

Bower, M. (2008). Affordance analysis: matching learning tasks with learning technologies, *Educational Media International*, 45:1, 3-15, DOI: 10.1080/09523980701847115.

Fung, D. (2015). *A Connected Curriculum for Higher Education*. In: http://discovery.ucl.ac.uk/1558776/1/A-Connected-Curriculum-for-Higher-Education.pdf

Holmes, W., Bialik, M., & Fadel, C. (2019). *Artificial Intelligence in Education: Promises and implications for teaching and learning*. Boston, MA: Center for Curriculum Redesign.

Holmes, W. (2019a). *Artificial Intelligence in Education Promise and Implications for Teaching and Learning*. ICOME 2019. http://icome2019.sustech.edu.cn/data/upload/zhuzhi/Prof._Wayne_Holmes.pdf.

Holmes, W. (2019b). *Artificial Intelligence in Education Promise and Implications for Teaching and Learning*. UNED 2019.

Laurillard, D. (2012). *Teaching as a Design Science: Building Pedagogical Patterns for Learning and Technology*. New York and London: Routledge.

Luckin, R., Holmes, W., Griffiths, M., & Forcier, L. B. (2016). *Intelligence Unleashed: An argument for AI in Education*. London, Pearson.

propose (Holmes et al., 2019) uses three main descriptors of AI in education. The classification is very relevant to this discussion as it divides the overall uses of AI in education into three main areas: Learning with AI, Learning about AI and Learning for AI.

However, we still miss a recognized pedagogical approach that allows us to describe systematically which AI applications to use to support specific learning activities and to reach specific learning objectives. So, we need a third theoretical building block. For this purpose, we selected elements from the ABC Learning Design method (Young & Perovic, 2016), which builds on Laurillard's six learning types (Laurillard, 2012). The ABC Learning Design approach recommends that 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.

The six learning types or activities outlined in the ABC Learning Design method include: acquisition, collaboration, discussion, investigation, practice and production. The definitions of each learning type can be found in Young & Perovic (2016) and are written on the actual cards used in the ABC Learning Design method. Structures and sequences are created with these cards as if it were a Lego game.

AI Pedagogy Planner

The idea of using an instructional design approach in the building of HE programmes has had a huge impact on educators and researchers all over the world, so we developed the AI Pedagogy Planner based on Bower (2008), Laurillard (2012), Fung (2015), and (Salmon, 2013). Let's first outline how the ABC Learning Design method works.

The AI Pedagogy Planner is a so-called decision 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 1.

Having selected the learning type, then it is time to select the AI learning types (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 1.

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. The abbreviations AWE, CB,

Rienties, B., Simonsen, H. K., & Herodotou, C. (2020). Defining the Boundaries Between Artificial Intelligence in Education, Computer-Supported Collaborative Learning, Educational Data Mining, and Learning Analytics: A Need for Coherence. *Frontiers in Education*. (5)128.

Rogaten, J., Rienties, B, Sharpe, R., Cross, S., Whitelock, D., Lygo-Baker, S., & Littlejohn, A. (2018). Reviewing affective, behavioural, and cognitive learning gains in higher education. *Assessment and Evaluation in Higher Education*, 44(3), 321-337.

Salmon, Gilly (2013). *E-tivities: The Key to Active Online Learning*. New York: Routledge.

Simonsen, H. K. (2020): AI i uddannelsessektoren – hvor langt er vi? In *Forsøg med uddannelsesdigitalisering og uddannelsesformater*. Edited by Henrik Køhler Simonsen. Pages 51-58. Samfundslitteratur

Young, C., & Perovic, N. (2016). Rapid and Creative Course Design: As Easy as ABC? *Procedia - Social and Behavioral Sciences*. Volume 228, pages 390 – 395.

Zawacki-Richter, O., Marín, V. I., Bond, M., & Gouverneur, F. (2019). Systematic review of research on artificial intelligence applications in higher education – where are the educators? *International Journal of Educational Technology in Higher Education*, Vol. 16, No. 1, pp. 1–27.

DBTS, ELE, ITS, LL, LA and AR/VR are abbreviations of different AI applications listed in the left-hand side of Figure 1.

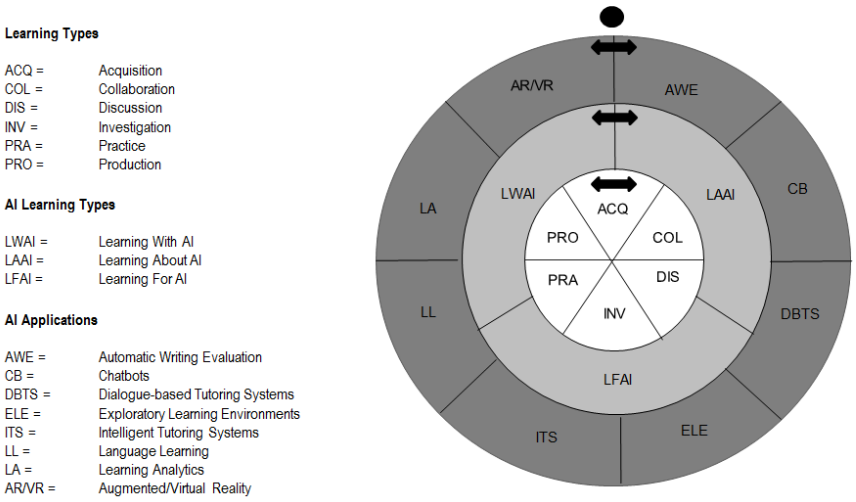

Figure 1. AI Pedagogy Planner

This follows the process used in the ABC Learning Design method, 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 each card the overall type of learning activity appears and the educator places several learning type cards on the storyboard, to structure and sequence the learning programme. All these choices are, of course, made to support the learning objectives of the programme. Once satisfied, educators are then asked to 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 start developing the final didactical activities in the classroom or the LMS in question. The same essential process has been used in the AI Pedagogy Planner.

Conclusion

This chapter analysed and discussed pedagogical applications of artificial intelligence in higher education and examined how AI applications may support specific online learning activities in higher education.

We contend that the decision support tool based on a picker wheel approach to AIED could be used in practice by instructional designers to facilitate pedagogically based decisions in the process of building the curriculum in higher education. Educators should lead AI. Educators should not be led by AI.

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Latent Space Models for Assessing Dynamic Student Behaviour

Innovative impact

As the field of education faces unprecedented challenges, instructors in science laboratory courses do their best to communicate knowledge to their students, both in terms of content and hands-on skills.

Virtual Reality (VR) applications, as self-paced educational tools, are a convenient solution offered today for distance training and learning on laboratory experiments.

In such learning environments, a science experiment can be presented by the software, and performed by the students, as a sequence of steps where the absolute order matters. The observed students' actions are sequential and are analysed using Markov-based techniques.

Along these lines, we consider scores of sequential data that embody dynamic student behaviour, and we aim to build latent state space models to assess students' performance revealing their abilities in certain learning contexts.

Introduction

The overabundance of data flowing in and out of the data ecosystems in our academic institutions, offers unprecedented opportunities for creating new added value services and organizational structures in the Educational Systems all over the world. Recently, we have embarked on a journey to delve into the temporal interaction of students with Adaptive and Virtual Learning Environments in Distance Learning, in order to further exploit potential patterns and regularities originating in longitudinal studies.

Science Laboratory Skills

In a science laboratory course, a way to evaluate the effectiveness of a certain learning procedure is to explore whether the outcomes has been fulfilled; Have the students understood the newly introduced concepts? Have the students managed to obtain the required laboratory skills? Although assessing the students' practical skills is a multidimensional task, the successful performance of a laboratory experiment can be a robust and sufficient indicator that a student has conquered all the necessary experimental skills that include knowledge, perception of the lab environment and hands-on abilities (Paxinou et al., 2020). New ICT applications such virtual labs, contribute to the assessing of these skills helping instructors overcoming the educational problems that arise from the complexity of these lab courses, especially in a pandemic or similar situation.

Onlabs and Bat Lab

Hellenic Open University has always been seeking new ways to communicate laboratory skills to the distance learning students. It was a students' demand to include, as a supplement to the printed and video material, an application that would help them gain remotely the basic laboratory skills in their science courses. To satisfy this need, a virtual laboratory called Onlabs has been developed to train them in science experiments by interacting with virtual lab instruments (Zafeiropoulos & Kalles, 2016). From the three available modes of Onlabs, the I*nstructional Mode* enhances learning by dividing the experiments into numerous sequential steps, with lower instinct cognitive load than the initial experiment, and by providing written instructions for each one of the individual steps. During the interaction with the VR environment, help buttons and error messages appear to the user's help. As a result through the interaction, different outcomes can be observed as students' action: *the guess* outcome, the *accurate attempt* outcome, the *inaccurate attempt* outcome, the *skip* outcome, the *long attempt* outcome, the *short*

References

Tsoni. R., Paxinou, E., Stavropoulos, E., Panagiotakopoulos, C., & Verykios, V. (2020). Looking under the hood of students' collaboration networks in distance learning. *The Envisioning Report for Empowering Universities*, pp. 39-41. The Netherlands: EADTU.

Paxinou, E., Panagiotakopoulos, C. T., Karatrantou, A., Kalles, D., & Sgourou, A. (2020). Implementation and Evaluation of a Three-Dimensional Virtual Reality Biology Lab versus Conventional Didactic Practices in Lab Experimenting with the Photonic Microscope. *Bioch. Mol. Biol. Educ.*, *48*(1), pp. 21-27.

Zafeiropoulos, V., & Kales, D. (2016). *Performance Evaluation in Virtual Lab Training*. In the proceedings of the Online, Open and Flexible Higher Education Conference, 455-468 The Netherlands: EADTU.

Lotsari E., Verykios V.S., Panagiotakopoulos C., Kalles D. (2014). *A Learning Analytics Methodology for Student Profiling*. In: Likas A., Blekas K., Kalles D. (eds) Artificial Intelligence: Methods and Applications. SETN 2014. Lecture Notes in Computer Science, 8445. Springer, Cham. https://doi.org/10.1007/978-3-319-07064-3_24

Kagklis, V., Karatrantou, A., Tantoula, M., Panagiotakopoulos, C. T., & Verykios, V. S. (2016). A Learning Analytics Methodology for Detecting Sentiment in Student Fora: A Case Study in Distance Education. *European Journal of Open, Distance and e-Learning*, 18. doi:

attempt outcome, the *requesting a hint* outcome, etc. The data derived from all the observed students' actions, are analyzed by the Big Data Analytics and Anonymization Lab (**Bat Lab**), through learning analytics techniques. The Bat Lab, in School of Science and Technology at the Hellenic Open University, conducts research in the field of large-scale data management and analysis, in conjunction with privacy protection of this data, with the view to understand students' behavior and interaction both with their peers but also with the teaching staff. The desired outcome is to be able to make decisions that will benefit not only the students, by improving the learning process in lab courses, but will also enable the Institution to elevate the provided services.

Learning Analytics and Science Experiments

Previous research indicated that this is usually a busy period were students' communication is quite active (Tsoni et al., 2020). While many studies, in the context of Learning Analytics and Educational Data Mining, have been focusing on building profiles of students and learners from simple interaction patterns of these students with the learning management systems and their peers or their tutors in order to predict their future progress and performance, still these analytical techniques fall short in identifying precise and complex students' behavioral patterns and traits, since these techniques focus mostly on measuring simple correlation patterns of predicting attributes with one or more unknown class variables (Lotsari, 2014; Kagklis, et al., 2016). The sequential nature of the learning process asks for a different approach of analyzing these interaction data, which needs to rely more on temporal characteristics, rather than simple value correlations. A sequential type of analysis manages to identify discriminating behavioral user patterns from mining the actions of students as they move through a state space of problems, as in a science experiment, to find a path towards an end goal.

Using a Markov Model Technique

A Markov sequence model seems to be an accurate representation of a sequential procedure where order matters, like a science experiment in a VR environment. A Markov sequence model assumes that an outcome at a particular position in the sequence, depends on the outcome in the previous position. That is, if a student's action is observed at the current position (step), then the probability of observing any one of the possible actions at the next position depends on a predetermined probability distribution. Although Markov Chain and Hidden Markov Models have been extensively used to model the behavior of individual students regarding their engagement and their motivation in the learning procedure, the use of such techniques to predict the students' actions in VR learning environments is new. The investigation of the capability of a Markov model to evaluate the students' performance in science experiments by tracing their knowledge states, is the first goal in this research. The use of such techniques for analyzing data observed in the context of an educational laboratory setting and in order to gain a better understanding of the educational process, with a view in improving its efficiency, is a second goal, equally important.

https://doi.org/10.1515/eurodl-2015-0014

Resources

Http://onlabs.eap.gr

An example

Let us focus on the completion of a process, in our case on the completion of an experiment in a VR environment like Onlabs, executed by a group of students. The experiment each student conducts, can be presented as a sequence of steps, each with a number of possible outcomes. As an outcome (state), we consider the observable student's actions in every step: ask for a hint (H), guess (G), accurate attempt (AcA), skip (S), etc. The process starts in one of these states and moves on successively, from one state to another, creating a sequence of states. The changes in the observed states across the sequence, are called *transitions* and the probabilities associated with various state changes are called *transition probabilities*. The transition probabilities can be visualized by a transition graph, where the transition probabilities are illustrated by an arrow from state *i* to state *j*. There is also a probability of remaining in the same state at the next step. Any transition probability matrix can be visualized by a transition graph, like the one that follows:

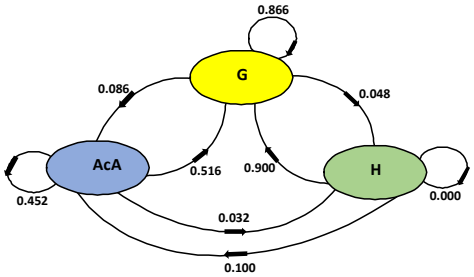

Figure 1: A graph of transition probability matrix

According to Figure 1, the probability of shifting from the state *guess* (G) to the state *accurate attempt* (AcA) is lower than the probability of shifting from the state *ask for a hint* (H) to the state *accurate attempt*. The probability for persisting in state G (86.6%) is higher than that of persisting in state H (0%), meaning that whenever a student gets a hint, he/she always responds successfully to the given instruction with an accurate attempt, whereas whenever he/she guesses in a step, there is a 86.6% probability to guess again in the next step. The figure above presents only a part of a bigger graph that can visualize all the transition probabilities in a science experiment, providing us with lots of useful information regarding the training procedure in the VR environment.

Conclusion

The full exploitation of the large amount of data available in VR learning environments is far to be completed. We live in an era of rapidly developing technology where information is being gathered at an ever increasing rate. The way we capture and analyse this huge wealth of data will determine how successful we are in improving the future of academia as well.

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Transversal Skills in STEM: From policy to practice, digital and unplugged

Innovative impact

This project has developed to date some key resources to help teachers develop professional skills and competencies in STEM education. Specifically, it has focused on how to develop key transversal skills with students in secondary (k-12) schools. The research reports of the project already published are currently being augmented and enriched through conversations with teachers, teacher educators and students to help further develop a flexible framework for digital assessment of STEM education and helping make learning visible for all stakeholders in areas where integration of skills from across disciplines is key to solving real world problems and challenges.

Introduction

Equipping students with key transversal skills has never been more important given the grand challenges that our planet faces. The Assessment of Transversal Skills project (ATS STEM) is an Erasmus+ KA3 Policy Experimentation project working to connect policy and practice around STEM education through formative digital assessment of key skills and competencies. This paper outlines the workings of the project to date, at a time when students are being unexpectedly unplugged from their physical educational spaces but re-connected to vital digital ones.

Assessment of Transversal Skills

Assessment of Transversal Skills in STEM (ATS STEM) is an innovative policy experimentation project being conducted across 8 EU countries and involving a partner network of 12 educational institutions. It aims to enhance digital assessment of second level students' transversal skills in STEM (Science, Technology, Engineering and Mathematics).

Weaving a framework for digital assessment of transversal STEM skills

A series of five reports were written after a desk-based research phase, involving a research team from Dublin City University drawn from three research centres with expertise in Digital Learning, Assessment and STEM education (NIDL, CASTEL, CARPE). These reports provided a theoretical base from which the project proceeded.

Report #1 'STEM Education in Schools: What Can We Learn from the Research?' is a selection of literature review informed by the identification of five research questions as deemed most relevant to the focus of the project. Overall, 79 publications were identified for inclusion in this review, and the emergent themes from our analysis of the selected literature in relation to each of the five research questions are presented in this report. We identified 243 specific STEM skills and competences, which were classified into eight core competences.

Report #2 'Government Responses to the Challenge of STEM Education: Case Studies from Europe' endeavours to trace the policy landscape across the eight partner countries and map overlapping areas of interest. The report scans other selected relevant STEM education policies both inside and outside of Europe with a highlight on STEM policy and educational initiatives targeted at specific underrepresented groups and industry collaboration with partnerships across a diverse stakeholder group.

Comparable examples

ATS2020

http://learn-stem.org/

References

Butler., D., McLoughlin E., O'Leary, M., Kaya, S., Brown, M. & Costello, E. (2020). Towards the ATS STEM Conceptual Framework. *ATS STEM Report #5*. Dublin: Dublin City University. http://dx.doi.org/10.5281/zenodo.3673559

Costello, E., Girme, P., McKnight, M., Brown, M., McLoughlin, E., & Kaya, S. (2020). Government Responses to the Challenge of STEM Education: Case Studies from Europe. *ATS STEM Report #2.* Dublin: Dublin City University. http://dx.doi.org/10.5281/zenodo.3673600

McLoughlin E., Butler., D., Kaya, S. and Costello, E. (2020). STEM Education in Schools: What Can We Learn from the Research? *ATS STEM Report #1*. Dublin: Dublin City University.

http://doi.org/10.5281/zenodo.3673728

Reynolds, K., O'Leary, M., Brown, M. & Costello, E. (2020). Digital Formative Assessment of Transversal Skills in STEM: A Review of Underlying Principles and Best Practice. *ATS STEM Report #3*. Dublin: Dublin City University. http://dx.doi.org/10.5281/zenodo.3673365

Szendey, O., O'Leary, M., Scully, C., Brown, M., & Costello, E. (2020). Virtual Learning Environments and Digital Tools

Report #3 'Digital Formative Assessment of Transversal Skills in STEM: A Review of Underlying Principles and Best Practice' addresses two major themes; first, consideration is given to the key ideas and principles underlying formative assessment theory. Second, the current state of the art with respect to how STEM digital formative assessment is conceptualised and leveraged to support learning of transversal skills in STEM is discussed.

Report #4 'Virtual Learning Environments and Digital Tools for Implementing Formative Assessment of Transversal Skills in STEM' foregrounds the discussion in a number of seminal frameworks for technology-enhanced learning and then outlines the potential of nine digital architectures to be used for formative assessment. It categorises these nine architectures into Virtual Learning Environments (VLEs) and Digital Assessment Tools.

Report #5 'Towards the ATS STEM Conceptual Framework' intends to draw on the first four reports and present an integrated conceptual framework for the assessment of transversal skills in STEM. The research that underpins this report provides a conceptual tool to help European education reach a common understanding of what integrated STEM education is and how it can be assessed using digital tools in schools.

(Image 1. Expanded ATS STEM conceptual framework)

for Implementing Formative Assessment of Transversal Skills in STEM. *ATS STEM Report #4*. Dublin: Dublin City University. http://dx.doi.org/10.5281/zenodo.3674786

Helping Teachers develop STEM digital assessment skills and Iterating the framework

The implementation phase of the project involved working with teachers across Europe to develop STEM digital competences in their students through formative and summative digital assessment. A network of teacher mentors across Europe worked to help teachers with their professional STEM competencies.

As the mentors began working with educators we noticed that parts of the framework really resonated with their practice whilst other aspects gave them new tools and ways of thinking. Mentors for example reported how they found iterative "ways into" a complex assemblage of concepts that the framework entails. Following from this level we are currently working on interviewing teachers about their experiences of using the framework so that we can feed this back into the framework as it is developed. We have given the teachers some tools from theory but we need the pearls of their practice now to help us develop the framework further and ensure it is a living document that can grow and adapt to its users' needs.

(Image 2. ATS STEM Teacher support materials)

Conclusion

Stakeholders at the ministry of education level and in teacher education centres are involved in the ATS STEM project directly as our researchers, teachers and of course students. The aim is to connect policy and practice and we conceive of policy development as a conversation with many participants. If you wish to join the discussion, we would love to chat with you. See our website and digital media channels (www.atsstem.eu, @stem_ats) or email the project co-ordinator Dr. Eamon Costello of Dublin City University (eamon.costello@dcu.ie).

"IO", the chatbot of the Faculty of Psychology (UNED) that supports students with their Final Degree Project

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UNED, Spain

Innovative impact

The UNED is a European university that uses non face-to-face teaching methodologies and has a very high total number of students (more than 200,000). Among its Faculties and Colleges, the Faculty of Psychology stands out as one of the three with the highest number of students enrolled (more than 33,000 students). The TFG is a compulsory subject of six ECTS that is taken in the second semester of the 4th year, the last year of the Psychology Degree, and is taken every year by almost 2,000 students.

The formal difficulty of this subject, together with its specific characteristics, make it especially costly for students, which gives rise to countless questions, comments and requests for guidance, both to the professors who direct the multiple lines of work and to those who are members of the TFG Coordination Team. These questions and requests for guidance focus on two types of content: on normative/formal matters of this singular subject; and on academic aspects directly related to the structure, organization and process of preparation of the final TFG document or report.

Introduction

Chatbot systems can improve student support services, especially when students are very numerous (or massive). Following the Dean's Team of the UNED Faculty of Psychology initiative, a chatbot was designed, developed and implemented, to offer students' an automatic personalised information service during their *Final Degree Project* (TFG) development. This experience was developed within the UNED's annual call for educational innovation projects, in the academic course 2019-2020. The chatbot was named "IO". IO is a virtual assistant and a visible part of a computer development distributed in several systems and based on cognitive science's computational techniques. The specific software, methodologies and computational approaches that support IO have been designed and programmed in the Faculty of Psychology by professors from the Department of Developmental and Educational Psychology, within the University's Results Transfer Plan. The systems that make IO possible, their characteristics and preliminary results are presented and explained in this paper.

What services does "io" provide?

IO distinguishes the normative or academic subject matter of each guidance request and question, as well as its specific details, which allows it to construct answers tailored to what is needed, and expressed in a formal and complete manner; answers that in many cases it ends by adding, as shortcuts, one or more direct links to other matters related to the issue addressed.

How does "io" work and what is it based on?

As mentioned above, IO is the visible part of a set of computational techniques belonging to the field of Cognitive Science, with an instructive purpose also about the discipline in terms of its applications. The techniques are the following:

Experience application

During the second term of the year 2019-2020, IO held more than 3,000 conversations, answered more than 10,000 questions and remained active in direct line with students more than 12,000 minutes; values that in human terms would be approximately equivalent to a workload for the professors of the lines and the TFG Coordination team of 25 days of eight hours each. And of course, IO is systematic in his answers, he never gets tired or bored and is always available (24/7) and attentive to what any student may require, he can support as many simultaneous conversations as necessary, i.e., there are no interruptions or waiting times or lists to be attended to).

The experience can be largely applied to other online and massive educational contexts in which students would benefit from a more personalized and continuous orientation and support.

Who has participated?
In addition to the Faculty of Psychology in its role as provider of academic and regulatory information on the TFG of the Degree in Psychology, the specialized company RE-INVENTA (https://www.re-inventa.es), a company focused on customer service technologies, has also participated in the hosting, AIML development and the implementation of the interface of "IO". Finally, it should be noted that the engines used, GallitoAPI® and Dialog Manager®, for the existence of the "IO" system have been provided by the company that

Semantic-vector spaces to represent the lexicon in its important dimensions, apply multivariate techniques and calculate similarities. This type of representation of language in Long-Term Memory are already classics in Psychology and have been used to simulate comprehension processes from them.

Examples are the MINERVA model (Hintzman, 1984), the HAL model -Hyperspace Analogue to Language- (Lund, Burgess, & Atchley, 1995; Lund & Burgess, 1996), LSA -Latent Semantic Analysis- (Landauer, 2007) and now more recently BEAGLE (Jones and Mewhort, 2007) and word2vec (Mikolov, Chen, Corrado, & Dean, 2013). It is also a classic in psychology the treatment of multivariate structures with different types of techniques, whether Principal Components, Correspondence Analysis or more applied techniques for the isolation of constructs such as Factor or Bifactor Analysis. Language is still a type of observable behaviour on which latent constructs or factors can be "separated".

Grammars to recognize certain grammatical structures that are important for the identification of the pragmatics of the conversation (names, topics outside the TFG, important data, etc.). As is well known, the formal representation of the grammatical structure of language is already a classic in psychology in the currents that defend the existence of universal rules applicable to all languages (recall the debates surrounding Chomsky's innatist positions). Grammatical analyses are also prolific in trying to isolate what information that is exploited, semantically or syntactically, in sentences with legitimate grammatical constructions, but with a certain type of ambiguity. Suffice it to recall the relative adjunctions in the "Garden Path" phenomena.

Neural networks for predicting properties of human productions. For example, to perform certain types of categorizations, to identify moods, etc.). Neural networks are another great acquaintance in psychology. Already from the beginning there was interest in the simulation of cognitive processes in their facet of learning the patterns of the input signal. Recall Rumelhart, McClelland et al.'s "Parallel Distributed Processing" (PDP) (1986). In fact, various types of network architectures have been used to simulate phenomena in psychology, especially longitudinal ones. See authors such as Thomas, Karmiloff-Smith, Elman, or McClelland himself. It is important to say that networks do not seek biological plausibility, but algorithmic plausibility (in D. Marr's terms). This means that they simulate cognitive processes, not biological synergies. But it is well known that this nuance is usually preceded by a long debate.

Techniques for formalizing the states of a conversation. A conversation is a sequence of states in which people offer and receive information. Therefore, the techniques must be sensitive to the changes of state and to the gain of information in each of them. There are strategies for conversations to produce effects on people, or to make people produce effects on their environment; for example, assertiveness training is well known. Formalization techniques such as those used by IO can be of great benefit in defining this type of strategy. In addition, and already landing, we could call this type of techniques ChatBot technology. This technology is also used in many places and

owns Semantia Lab (a Technology-Based Company and spin off of the UNED).

References

Hintzman, D. L. (1984). MINERVA 2: A simulation model of human memory. *Behavior Research Methods, Instruments, & Computers*, *16*(2), 96-101.

Jones, M. N., & Mewhort, D. J. (2007). Representing word meaning and order information in a composite holographic lexicon. *Psychological Review*, *114*(1), 1.

Landauer, T. K. (2007). LSA as a theory of meaning. *Handbook of latent semantic analysis*, *3*, 32.

Lund, K., & Burgess, C. (1996). Producing high-dimensional semantic spaces from lexical co-occurrence. *Behavior Research Methods, Instruments, & Computers*, *28*(2), 203-208.

Lund, K., Burgess, C., & Atchley, R. (1995). Symantec and dissociative priming in highdimensional space. In *Cognitive Science Proceedings* (pp. 660-665).

Mikolov, T., Chen, K., Corrado, G., & Dean, J. (2013). Efficient estimation of word representations in vector space. *arXiv preprint arXiv:1301.3781*.

Rumelhart, D. E., McClelland, J. L., & PDP Research Group. (1986). Parallel distributed processing. Exploration in the Microstructure of Cognition, 1: Foundation. *Volume1, MIT Press / Bradford Books*, *198*(6).

environments, mainly to collect or offer information through the direct conversational interaction of a machine with a person. Many companies and institutions have incorporated this resource into their websites. However, in the field of Education and Psychology they are also demonstrating great possibilities of application; for example, in the training of teachers in the resolution of behavioural problems in the classroom, or psychologists in psychotherapy techniques, among others, through the design of practical exercises with simulators of schoolchildren and patients with prefixed, adjustable characteristics and behaviours, and with options for analysis and unlimited repetition.

What technologies does "io" employ?

The specific technological artifacts or platforms in which the computational processes reside and are carried out and which are, in short, the tools responsible for the existence of IO and its operation are:

- **DIALOGUE MANAGER®** (http://dialogue.elsemantico.es/especifications/index.html)

Extended AIML interpreter, conversation states and internal knowledge base.

- **GALLITOAPI®** (www.gallitoapi.net)

Linguistic analysis engine for external knowledge sources: vector models, neural networks, grammars, edit distances, etc.

Evaluation and Conclusions

The overall assessment of the experience has been very positive, both in terms of the development of new processes of linguistic analysis and conversational formalizations, as well as in the efficient information service provided to the students, which on the other hand, has also meant an important saving of time for the faculty involved in the direction of the TFG lines and in its coordination, since it has allowed them to dedicate this "earned" time to other teaching tasks of greater complexity and projection. At the same time, implementing IO has highly stimulated teaching reflection processes by attempting to optimize the inner structure of the information given to students.

On the other hand, the experience has contributed to strengthen the idea, already pointed out in one of the original objectives of the Project, **of initiating a line of research in the technological formalization of conversations with numerous and innovative applications in very diverse areas of Psychology**, such as psychotherapy, psychometrics, diagnostic evaluation..., through the development of virtual simulators that interpret specific roles (role playing) for different purposes and in different fields (research, training, and professional practice).

Finally, it makes sense to highlight the **synergy between the company and the university** that the implementation of this project has established between the **UNED**, **Semantia Lab** (spin off company of the UNED and created within the framework of its Research Results Transfer Plan) and **Reinventa S.L.** (a company consolidated in the sector and specialized in automatic customer service systems).

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Learning in the Real World using Augmented Reality and Wearable Technology

Innovative impact

Learning and training with Augmented Reality has moved out of the experimental space into the coming mainstream – thanks to the AR learning system, MirageXR, described in this article. MirageXR is open source and available cross-platform for iOS, Android, and Hololens, implements the IEEE standard for AR learning experience models (P1589-2020), and links with the freshly developed Moodle back-end repository plugin. These three building blocks pave the way for massive scaling of AR learning in Higher Education: an open source state-of-the-art cross-platform app with innovative features such as GhostTrack and, soon, holographic Ais; a standardised content model that ensures long-term preservation, network effects, and a rich eco-system of production tools; and the integration with the widely used learning management system Moodle. This promises a prosperous future for 'learning in the real-world', opening up formerly inaccessible areas to systematic Higher Education that previously were extremely restrictive with 'looking over the shoulder' type of approaches. The next challenge now is to reach a million AR learning activities, globally.

Introduction

Learning new skills requires both competence – a theoretical understanding of what to do to complete a task successfully – as well as practical experience – a track record demonstrating *how* best to do it with a good level of performance. Wearable technology platforms, particularly those incorporating a level of sensory augmentation, are well suited to providing a learner with information and feedback on how to improve both these parts (Buchem, Klamma, and Wild, 2019). This is the premise of Performance Augmentation, seeking to "bridge the dissociative gap between abstract knowledge and its practical application, researching new methods to connect knowing something 'in principle' to applying that knowledge 'in practice' and speeding up the refinement of experience and its integration into polished performance" (PAL, 2021).

MirageXR is an open-source reference implementation of such a next generation learning and training system for Performance Augmentation, developed by a range of institutions lead by the Open University, RWTH Aachen, WEKIT ECS Ltd, NTNU, and UCD. Developing systems that can support the development of performance need to rely on models that specify not only the actions taken by the learner, but also the environment (workplace, lab, classroom…) in which the actions take place. This environment is scanned, oriented and populated with virtual objects and the activity is performed amongst them, in a frame of reference common to the task. This standardisation, realised in the Augmented Reality Learning Experience Model (ARLEM, IEEE P1589-2020), provides the basis for the transference of an experience from one person to another or one place to another.

MirageXR is a practical demonstration of how this standard can be used to deliver *in situ* authoring and reenactment capabilities for the transference of AR experiences. Demonstrations of this platform have already shown promise in the fields like radiology, aeronautics, astronautics, or manufacturing. The use of MirageXR has been seen as effective in procedures where there is a high cognitive requirement, such as during inspection or maintenance procedures (Limbu et al., 2018; Xue et al., 2018) or where they take place in challenging environments, such as the surface of Mars, where direct training experience is impossible (Ravagnolo et al., 2019). The most recent release (March 2021) will see the development of many more use cases.

References

PAL (2021): Research programme of the Performance Augmentation Lab, Institute of Educational Technology, The Open University, UK, online at https://pal.edtech.institute/research-programme/

Limbu, Bibeg; Jarodzka, Halszka; Klemke, Roland; Specht, Marcus (2018): Using sensors and augmented reality to train apprentices using recorded expert performance: A systematic literature review, In: Educational Research Review 25(2018):1-22, https://doi.org/10.1016/j.edurev.2018.07.001.

Xue, Helene; Sharma, Puneet; Wild, Fridolin (2019): User Satisfaction in Augmented Reality-Based Training Using Microsoft HoloLens" Computers 8(1):9.https://doi.org/10.3390/computers8010009

Ravagnolo, Liliana; Helin, Kaj; Musso, Ivano; Sapone, Rosa; Vizzi, Carlo; Wild, Fridolin; Vovk, Alla; Limbu, Bibeg Hang; Ransley, Mark; Smith, Carl H. and Rasool, Jazz (2019). Enhancing Crew Training for Exploration Missions: The WEKIT Experience. In: Proceedings of the International Astronautical Congress, International Astronautical Federation, Paris, 2019.

IEEE P1589-2020 (2020): IEEE Standard for Augmented Reality Learning Experience Model, Learning Technologies Standards Committee, IEEE Computer Society, Learning Technologies Standards Committee

Buchem, Ilona; Klamma, Ralf; Wild, Fridolin (2019):

Motion capture data, more recently with wearable technology, has also been used to build models or visualisations of physical performance. Capturing physiological data, while still relatively unexplored, has a variety of possible benefits, from simpler metrics such as those informing the design of efficient workplace layouts, to enabling mimicry of what an expert is demonstrating, to more abstract notions of focus, attention, or stress.

MirageXR

MirageXR can be broken down into three interrelated parts – authoring, course integration, and practice. Each situated learning experience is recorded by a teacher, trainer, or technical expert, after which it is uploaded to Moodle and embedded in the right spot within a programme and course. From here, learners can access it alongside all other course materials and undertake the AR learning activity.

MirageXR is...	For educators:	For learners:
A set of authoring tools	• Authoring experiences in real-world situations. • Curate and upload activity sequences. • Store workplace layouts for later use.	• Learners can also construct private activities.
✚ Integrated with standard courses	• Manage course schedule and content online. • Track enrolment and progress as usual.	• No alarms: content on-demand. • No surprises: just log on, download and start.
✚ All about learners practising skills	• Track learner progress in demonstrating both understanding *and* competence.	• Repeat steps or whole procedures. • Discuss actions, rather than just ideas. • Immediately see the impact of proficiency.

Figure 1. Diagram of Key benefits of MirageXR.

MirageXR[1] is both authoring tool and learning environment. An educator's first step is to construct a new learning experience model by placing augmentations in the environment and setting up a procedural sequence that the learners will follow. Content is thereby generated in situ in Augmented Reality, but can subsequently (or alternatively) also be edited on the Web using the Moodle repository plugin.

From the perspective of the learners, AR learning activities are rolled out via courses. Once logged on to the Moodle in the MirageXR app, the activity selector gets populated with the assignments due – and users simply click to download and execute the learning experience they want to have.

The repository services for the AR learning content are managed with Moodle, using the ARLEM repository plugin[1]. The plugin exposes web services for storage and retrieval to the MirageXR apps, allowing authenticated users to upload their activities to the Moodle instance they have configured in the app settings.

Having recorded a learning activity, the educator can, from a course management system (outside of AR), review and edit the recorded content, fine tuning or further describing the workflow. Digital recordings, such as video or audio, can then be edited, replaced or otherwise modified using the educator's favourite application. The data stored in the repository allows educators to build up their own repository of learning experiences and AR content.

Introduction to Wearable Enhanced Learning (WELL): Trends, Opportunities, and Challenges, In: Buchem, Klamma, Wild (Eds.): Perspectives on Wearable Enhanced Learning, Springer:https://doi.org/10.1007/978-3-319-64301-4_1.

Ras, Eric; Wild, Fridolin; Stahl, Christoph; Baudet, Alexandre (2017). Bridging the Skills Gap of Workers in Industry 4.0 by Human Performance Augmentation Tools: Challenges and Roadmap. In: *Proceedings of the 10th International Conference on PErvasive Technologies Related to Assistive Environments,* Association for Computing Machinery, New York, NY, USA, 428–432. DOI: https://doi.org/10.1145/3056540.3076192

Fominykh, Mikhail; Wild, Fridolin; Klamma, Ralf; Billinghurst, Mark; Costiner, Lisandra S.; Karsakov, Andrey; Mangina, Eleni; Molka-Danielsen, Judith; Pollock, Ian; Preda, Marius; Smolic, Aljosa (2020). Model Augmented Reality Curriculum. In: Proceedings of the Working Group Reports on Innovation and Technology in Computer Science Education (ITiCSE-WGR '20). Association for Computing Machinery, New York, NY, USA, 131–149. DOI:https://doi.org/10.1145/3437800.3439205

For the learners, MirageXR communicates securely with a learning record store (LRS) to log learner behaviour. We recommend currently the use of LearningLocker, an Open Source project[1], but any LRS compatible with the xAPI protocol will do.

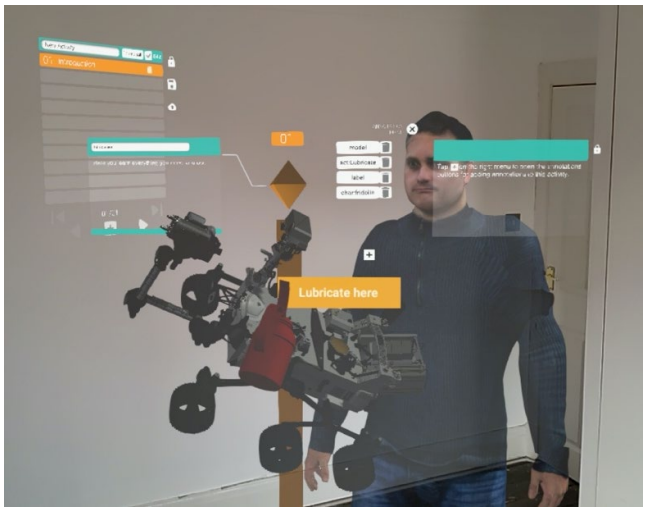

Figure 2. Mixed Reality capture of the authoring mode of MirageXR in action: a Mars rover with additional oil-can glyph and label, in the background a character model.

The key to improving performance is "practise, practise, practise". Now users can engage in guided real-world learning tasks and repeat them as often as they wish autonomously. In many cases the learners will be actually performing the task when learning it, giving them immediate and direct feedback about what it is like to do the task and how successful their actions have been.

Conclusion

Through the responsive interaction with the real-world, learners are guided to develop skills that are otherwise difficult to train, particularly beneficial to areas where technical expertise is required. MirageXR as a reference implementation of the IEEE ARLEM standard demonstrates what is possible with wearable enhanced learning, a small step closer to augmented humans, who go from zero skill to a productive level of performance in no time.

Any other universities who want to join us in the development of this exciting open-source project are cordially invited. To bring you up to speed, we provide two online courses on CodeReality.net, teaching foundations and advanced AR software development following the recently released curricular recommendation for AR software engineering (Fominykh et al., 2020).

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[1] https://platform.xr4all.eu/wekit-ecs/mirage-xr/
[2] https://github.com/ARETEedu/moodle-ARLEM_repository
[3] https://learninglocker.net/

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Industry 4.0 education: state of art and future trends

Innovative impact

In the last decade, the advent of the fourth industrial revolution has radically changed the prospects first of the manufacturing industry and then of various related sectors. The number of smart (connected) object nowadays is close to 30 billion, about four times the world population. In every sector, not only economic and productive but also social, the digital transition is taking place.

Among the impacts of this digital revolution, there is an urgent need to quickly acquire skills related to topics that did not exist until ten years ago. In the industrial sector alone, this means training or retrain hundreds of thousands of workers at European level. Universities and VET centres are trying to face this educational emergency, but they have to deal with constantly evolving technologies. Moreover, the job market greedily requires professionals who were not trained until a few years ago.

In this context, on the web there is a great abundance of disorganized didactic contents, often not qualitatively validated and not always easily accessible. At this time, to cope with the great demand for training, it would be desirable to create large structured repositories of quality OERs, useful for all those who intend to acquire skills on the digital revolution.

The Forth Industrial Revolution

The term Industry 4.0 was early defined in Germany in 2011 and refers to the fourth industrial revolution, which involves the transformation of the whole industrial production. It took place thanks to the fusion of digital technology and the Internet with conventional manufacturing. The Industry 4.0 paradigm intends to create a digital connection between all traditional manufacturing operations (suppliers, plants, distributors, products), to give rise to what is called a connected factory and therefore to give rise to an integrated value chain.

A series of enabling digital technologies envisage a new season of industrial development and promise a radical change in the way of producing and doing industry. These include mechatronics, robotics, IoT, Big Data, Cloud Computing, IT Security, 3D Printing, Simulation, Nanotechnologies, Smart Materials. The real and virtual world have to be integrated into "cyber-physical systems". The digitization of the production system is necessary to increase production capacity, to relaunch the economy and ensure the competitiveness of companies at an international level.

Industry 4.0 is estimated to have a huge impact on the world economy. Studies estimate in Europe, with annual investments of 60 billion euros until 2030, the potential added value is 500 billion euros and the creation of 6 million jobs. All the main industrialized countries have adopted specific policies to encourage the spread of the Industry 4.0 model. However, it is not just about stimulating investment in new technologies. A real problem has emerged in terms of new skills to be acquired by a sector that has 2 million companies and 33 million workers in Europe alone. It is a huge educational challenge for universities and VET centres, to be faced quickly if they want to be able to respond to the new needs of the labour market.

Key competences for Industry 4.0

According to the most commonly adopted scheme, the Industry 4.0 model is based on so-called "9 pillars": Big Data, Internet of Things, Additive Manufacturing, Collaborative robotics, Cybersecurity, Cloud Computing, Augmented reality, Simulation, Horizontal and Vertical Integration. Although all these pillars are important to fully implement the Industry 4.0 model, not all of them correspond to equally mature technologies. Consequently, both in terms of the demand for professional figures and available training courses, some differences can be found. This analysis allows both to understand the topics in which universities and VET centres have innovated their curricula the

Comparable examples

The project "Key competences for an European model of Industry 4.0", funded by the European Commission in the framework of the Erasmus+ programme, intends to define a qualification framework recognized at European level and a set of OERs for Industry 4.0. Visit https://www.i4eu-pro.eu/

References

Assante, D., Caforio, A., Flamini, M., & Romano, E. (2019, April). Smart Education in the context of Industry 4.0. In 2019 *IEEE Global Engineering Education Conference (EDUCON)* (pp. 1140-1145). IEEE.

Baygin, M., Yetis, H., Karakose, M., & Akin, E. (2016, September). An effect analysis of industry 4.0 to higher education. In 2016 *15th international conference on information technology based higher education and training (ITHET)* (pp. 1-4). IEEE.

Benešová, A., & Tupa, J. (2017). Requirements for education and qualification of people in Industry 4.0. *Procedia Manufacturing*, 11, 2195-2202.

Davis, R., Sessions, B. O., & Check, A. R. (2015). Industry 4.0. *Digitalisation for productivity and growth, European Parliament, Members' Research Service*.

Hecklau, F., Orth, R., Kidschun, F., & Kohl, H. (2017, December). Human resources management: Meta-study-analysis of future competences in Industry 4.0. In *Proceedings of the International Conference on Intellectual Capital, Knowledge Management & Organizational Learning* (pp. 163-174).

most in recent years, and the topics on which it will be necessary to invest in the near future.

Big Data

In Industry 4.0, data is considered the new source of richness. It is no coincidence that we speak of the "data-driven economy". Big Data Analysts are today among the most sought after professionals in the job market, both for the extremely particular skills they must have, and for the value that their analyses can produce. For this reason, universities in particular are making great efforts to activate courses or even entire degrees related to Big Data, both at a basic and very advanced level.

Internet of Things

Internet of Things (IoT) is a technology with the highest growth rate in recent years in terms of products, services and market value. IoT Experts are in high demand on the job market today: they include experts in embedded systems, wireless communications, sensors and IoT platforms. Although the discipline is new, also in terms of training courses, there is a very rapid spread of IoT courses of various levels, in universities, VET centres and in the corporate sector. A course on "Green digital ecosystems" aimed at developing the circularity of digital processes and products should be also introduced.

Additive Manufacturing

Although it was born in the 80s, additive manufacturing (AM) and in particular 3D printing has begun to spread on a large scale only in the last decade. Therefore, figures such as the AM Designer or the AM Process Engineer are still in limited demand on the job market. Despite this, more and more training courses on AM and 3D printing are spreading, even if they are mostly basic courses. On the other hand, it is much more difficult to find advanced / professional courses.

Collaborative robotics

Requested professionals figures are Software and Hardware Engineers, Experts of Robotics, UX Designer. As collaborative robotics increasingly relies on the use of machines that can learn on their own, Machine Learning Experts are also in high demand. In terms of training courses, robotics is a well-established and widespread discipline, therefore in general it is possible to find well-structured training courses accompanied by teaching materials of various kinds. There is also a rich amount of OERs. However, if we consider collaborative robotics in particular, the situation is more complex and it is much more difficult to find training courses. Often they are carried out by the same manufacturers of the machinery, but they are hardly found in universities and VET centres.

CyberSecurity

CyberSecurity is a topic studied since the diffusion of computers and has become even more important in Industry 4.0, with the massive digitization of industrial processes and data. Security Administrators, Cyber Risk Manager and Security Analyst are professional figures highly requested by the labour market. Due to their importance, high quality and updated training course can be easily found, offered not only by Universities and VET centres, but also from the corporate sector.

Hecklau, F., Galeitzke, M., Flachs, S., & Kohl, H. (2016). Holistic approach for human resource management in Industry 4.0. *Procedia Cirp*, 54, 1-6.

ICV, International Controller Association (2015). *Industrie 4.0 - Controlling in the Age of Intelligent Networks*.

Lasi, H., Fettke, P., Kemper, H. G., Feld, T., & Hoffmann, M. (2014). Industry 4.0. *Business & information systems engineering*, vol. 6(4), 239-242.

Lu, Y. 2017. *Industry 4.0: A survey on technologies, applications and open research issues*. Journal of Industrial Information Integration, Vol. 6, pp. 1-10.

Rojko, A. (2017). Industry 4.0 concept: Background and overview. *International Journal of Interactive Mobile Technologies*, 11(5).

Schuster, K., Groß, K., Vossen, R., Richert, A., & Jeschke, S. (2016). Preparing for industry 4.0–collaborative virtual learning environments in engineering education. In *Engineering Education 4.0* (pp. 477-487). Springer, Cham.

Tvenge, N., & Martinsen, K. (2018). Integration of digital learning in industry 4.0. *Procedia manufacturing*, 23, 261-266.

Ustundag, A., & Cevikcan, E. (2017). *Industry 4.0: managing the digital transformation*. Springer.

Xu, L. D., Xu, E. L., & Li, L. (2018). Industry 4.0: state of the art and future trends. *International Journal of Production Research*, 56(8), 2941-2962.

Cloud Computing

Cloud Computing is another of the technologies in great expansion in the last decade, thanks to the virtualization of many services and resources. Cloud Specialists, Cloud System Engineers and Cloud Architects are highly appreciated and in demand in the job market. The corporate sector first and then the universities have grasped this need, offering for some time a great variety of courses on the Cloud, both basic and advanced.

Augmented and Virtual Reality

Since these technologies are not related to new specific machineries but enhance the existing ones and the whole production process, it is hard to define specific professional figures. These technologies can be seen are added skills for mechanics, engineers, service technicians, electronic technicians, mechatronics technicians and logistics technicians and operators. Although these are new and not yet fully mature technologies, we are starting to see different training courses and different training tools.

Simulation

In principle, Simulation is an ancient discipline compared to all the previous ones. However, Industry 4.0 has taken simulation to a new level. "Digital Twins" and "Cyber Physical Systems", that is computer systems able to interact continuously with the physical system in which it operates, are completely new concepts which however are one of the foundations of Industry 4.0. The skills to design and use these models are not yet well defined, as are the professionals connected to them. For this reason, even in terms of training, there are still significant shortcomings.

Horizontal and Vertical Integration

Horizontal and Vertical Integration is one of the biggest challenges of Industry 4.0, as it does not concern the adoption of a specific technology but rather a change of process and organization. It concerns the expansion of the company to complementary products, services or technologies (horizontal) and the internalization of all phases of a production process (vertical). It is difficult to define skills and competences necessary to carry out these tasks, which mainly concern management. Similarly, it is extremely difficult to find training courses on this topic. This is a big gap, because in the Industry 4.0 model vertical and horizontal integration are essential for the construction of a smart factory.

Conclusion

Industry 4.0 represents the future of the global manufacturing economy. It is an inevitable path for companies not to maintain competitiveness, but also to increase their resilience. Recent studies show that the companies that have suffered the least from the Covid-19 crisis and are recovering most quickly are those that managed to complete the adoption of the Industry 4.0 model before the start of the pandemic. The world of training is called to a great educational challenge, to support the business world in the digital transition.

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AIED: raising awareness on risks of biases in sexism and discrimination

Innovative impact

AIED is definitely an innovative technology with a high disruptive potential, which carries significant risks for individuals. AIED systems learn from humans because they are programmed by humans. Therefore, there's a good chance they'll also adopt the biases–gender, racial and socio-economic discrimination that exist in society.

Correcting the biases of technology and EdTech is essential to combat the gender gap and other risks of discrimination.

Learning data must be well-curated, privacy and security must also be ambitiously addressed to comply with regulations and all levels of education should stimulate and empower women roles in technology, and specifically in AI and AIED software and algorithms development. Research should act as a call to build ethics while developing AI and AIED technologies.

Introduction

While we may not see humanoid robots acting as educators within the next decade, there are many educational systems in place that use artificial intelligence (AI) to help learners and educators get the most out of the learning experience. One of the key ways of how AI will impact education is through the application of greater levels of individualised and personalised learning helping artificial intelligence in education (AIED) ecologies to be better adapted to learners and educators' needs, including those with special needs (Rodrigo & Tabuenca, 2020).

AIED: artificial intelligence in education

AI can automatize the administrative duties for educators and institutions. Educators are usually overloaded with repetitive tasks (marking exams, assessing homework), because continuous assessment processes contain dozens of assessment figures for each learner. In e-learning it is necessary to gather lots of data about learner progression, to avoid plagiarism and guarantee learners' identity.

AIED-based chatbots are a very powerful educational tool, they can be used for updating institutional information or improve learners' support and services (Singh, 2018; Iniesto et al., 2020). Chatbots can facilitate learners' requests, i.e. helping learners on the registration process, or other administrative duties. They can also collect information about learners' preferences and interaction. Chatbots curate answers on demand resolving issues fast and in a way that feels natural, therefore they can better instant feedback allowing richer interactions and learning in and outside of the classroom with 24x7 availability.

In that sense and regarding instant feedback, whether it is for the learner or educator, it is very important to improve the learning process: learners nowadays are already used to instant messaging software and social media. Educational institutions need to speed up their learner communication processes to draw the attention of this fast-paced and instant generation. Therefore, game-like, avatar simulations can also enhance learner's engagement (Curtin Univ., 2019). Educators spend lots of time providing valuable responses to their learners. In this area, intelligent tutoring systems can provide a personalised learning environment to the learners by analysing their responses and how they go through the learning content, even presenting real case situations through virtual environments, avatars and chats for textual or voice interaction.

References

Burnett, M. (2017). Gendermag: getting gender biases out of software. Journal of Computing Sciences in Colleges, 33(1), 100-101.

Chin, C. & Robison, M. (November 23, 2020) How AI bots and voice assistants reinforce gender bias Retrieved March, 2021 from: https://www.brookings.edu/research/how-ai-bots-and-voice-assistants-reinforce-gender-bias/

Curtin University Press (August 26, 2019) 'Jim the avatar' to help train accounting students at Curtin Singapore https://news.curtin.edu.au/media-releases/jim-the-avatar-to-help-train-accounting-students-at-curtin-singapore/

DAXX Report (2020) How Many Software Developers Are in the US and the World? Recovered March, 2021 from https://www.daxx.com/blog/development-trends/number-software-developers-world

Holmes, W., Bialik, M., & Fadel, C. (2019). Artificial intelligence in education. Boston: Center for Curriculum Redesign.

Iniesto, F., Coughlan, T., Lister, K., & Holmes, W. (2020). Designing an Assistant for the Disclosure and Management of Information about Needs and Support: the ADMINS project. In The 22nd International ACM SIGACCESS Conference on Computers and Accessibility (pp. 1-4).

Munappy, A., Bosch, J., Olsson, H. H., Arpteg, A., & Brinne, B. (2019, August). Data management challenges for deep learning. In 2019 45th Euromicro Conference on Software Engineering and

Aside from all the above systems, Data Science (DS) and Learning Analytics (LA) (Rienties et al., 2020) are used to tackle big data and include data cleansing, preparation and analysis. AIED systems can provide powerful support for educators in the iterative process of improving the effectiveness of their teaching and enhancing learners' performance. AIED systems can gather data from multiple sources and apply machine learning, predictive analytics, and sentiment analysis to extract critical information from the collected data sets, plotting them into nice-looking dashboards and graphical indicators. Both DS and LA enable educators to explore and correlate user preferences, behaviour and interactions with learning objects usage, accesses to platforms and repositories, learning activities and assessment results. LA helps to process large data sets in microseconds concerning individual data analysis interests of educators and assuring data privacy issues of learners, if it is well programmed, complying with specific privacy-by-design guidelines (e.g. the EUR GDPR – European General Data Protection Regulation).

Facts for risks

Scientists have researched to show that AI can have some discriminatory aspects along with making human life easier. Burnett (2017) developed the GenderMag method to help software developers and usability professionals find and fix software features with gender-inclusiveness "bugs". Nowadays, we have countless examples of female AI personas, i.e., personal assistants that can reinforce negative stereotypes of women as subservient (e.g. Siri and Alexa). Besides, if voice recognition technologies are trained and tested only by men, the systems will struggle to understand female voices.

Fact 1: AIED data are not correctly processed and algorithms may be biased

AI encompasses the broad fields of data capture, storage, preparation, and advanced analytics technologies. But data are never objective and usually are unclean (Munappy et al, 2019), that's the main reason why nowadays the current data challenge in most businesses, including educational institutions, is to struggle with poor data quality: the existence of data silos, bad data, data compliance, and mainly, lack of data experts and inadequate systems. This growing problem has significantly reduced business customers' (e.g. lecturers and educators) faith in data-driven decisions. Data quality-related problems surfaced in historical data, which may have been gathered from multiple sources with inconsistent standards and varying levels of accuracy.

AI-based systems, included those used in educational contexts, train their algorithms with a source of data moderated by mathematical weights (parameters). At this point, the biases appear simply because these databases may contain a greater amount of male than female sourced data simply due to historical reasons. Also, AI algorithms are trained, based on pre-fixed case studies to deliver predictions and build data categorisation (e.g. clustering types of learners). Machine learning is difficult to apply and often it involves making hypothetical corrections that require expertise using the system to act with fairness.

Advanced Applications (SEAA) (pp. 140-147). IEEE.

Raré T.W. (Nov 3, 2020) Improving Gender Diversity Within Tech Companies. Forbes Business Council Press. Retrieved March, 2021 from: https://www.forbes.com/sites/forbesbusinesscouncil/2020/11/03/improving-gender-diversity-within-tech-companies/

Rienties, B, Olney, T., Nichols, M., & Herodotou, C. (2020). Effective usage of learning analytics: what do practitioners want and where should distance learning institutions be going?. Open Learning: The Journal of Open, Distance and e-Learning, 35(2), 178-195.

Rodrigo, C., & Tabuenca, B. (2020). Learning ecologies in online students with disabilities. Comunicar. Media Education Research Journal, 28(1).

Sparck-Jones, K., & Runciman, B. (2007). Computing is too important to be left to men. ITNow, 49(4), 18-20.

Singh, R. (May 2, 2018) AI and Chatbots in Education: What Does The FutureHold? https://chatbotsmagazine.com/ai-and-chatbots-in-education-what-does-the-futurehold-9772f5c13960

Tempelaar, D., Rienties, B., & Nguyen, Q. (2020). Subjective data, objective data and the role of bias in predictive modelling: Lessons from a dispositional learning analytics application. PloS one, 15(6), e0233977. https://doi.org/10.1371/journal.pone.0233977

Fact 2. Who are programming the algorithms?

The technology and EdTech industries are gender diversity biased (Raré, 2020): a study observed that the number of US computer science jobs expected in 2020 is 1.4 million. However, only 29% of those jobs will be filled due to labour shortages in the industry, and worse still, estimates show that only 3% of the jobs will be filled by women. Self-reported diversity statistics from some of the largest technology companies in Silicon Valley show that men vastly outnumber women in programming jobs. At Google, women make up 17% of technical employees; at Facebook, it's just 15%; while worldwide 27.5% of developers are women (DAXX Report, 2020). In the Global North, female participation in computer science has plunged since the mid-80s, while female participation in medicine and other scientific fields has increased steadily. In the UK only 16% of computer science undergraduates –and a similar proportion in the US –are female. Fortunately, figures vary between continents and countries, the balance is different in India, Malaysia and Nigeria where more than 50% are women.

Conclusion

AIED is definitely an innovative technology with a high disruptive potential in education, which carries significant risks for individuals. If a computer system reaches a biased conclusion, it is because someone has programmed it to do so; AI systems learn from humans because they are programmed by humans. Therefore, there is a good chance they will also adopt biases that exist in society such as gender, racial and socio-economic discrimination (Rodrigo, 2019). The emergence of trace data from digital learning environments has sparked a controversial debate on how we measure learning (Tempelaar et al., 2020). To avoid deviations, data must be well-curated, privacy and security must also be ambitiously addressed to comply with legislations.

For many years young women have been kept away from STEM professions. Inside the male-dominated environments, women can often suffer isolation and a hostile environment; culturally male software engineers were like nerds (sometimes called the male computer geek stereotype). These aspects might lead to women' disengagement and lack of motivation. There is compelling evidence that unconscious biases have a powerful effect on what people expect from themselves to be good at, therefore, correcting the biases of technology are essential to combat the gender gap in digital skills. All levels of education should stimulate and empower women roles in technology, and specifically in AI and AIED software and algorithms development. Research should act as a call to build ethics while developing AI and AIED technologies (Holmes et al., 2019). As Karen Spärck Jones, a pioneering British computer scientist who campaigned to encourage more women into the field said: "computing is too important to be left to men" (Sparck-Jones & Runciman, 2007); therefore, why Siri and Alexa could not have a gender-neutral personality (Chin & Robison, 2020).

Integrating Short Learning Programmes (SLPs) and MOOCs in HE provision

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AMED - Towards a dual-mode university: Co-design of a short learning program for capacity building

Innovative impact

This contribution presents an overview of the process of design and development of a contextualized and tailor-made short learning program (SLP) (Maina et al., 2019) as part of a strategy leading to the institutional digital transformation of the Maldives National University (MNU). The program is targeted at the professional development of lecturers and senior level staff with the main purpose of training them in key aspects regarding the transformation of the university towards a bimodal model, thus implementing blended learning as a pivotal strategic approach for the institution.

Introduction

In recent years, and particularly during the COVID-19 global pandemic, the different modes in which higher level education is delivered has sparked much debate. Our new normal of social distancing highlights the urgent need to ensure that all students have access to quality education anywhere in the world at any time. However, this is no easy feat given the societal pressure that expects universities to provide said quality education and meet the needs of students while remaining innovative, affordable, cost-effective and relevant (Damewood, 2016). Although advances in technology have generated the "digital disruption of education" (De Wit et al., 2016, p. 77), higher education institutions face many challenges in terms of the societal and economic limitations to implement the use of technologies (Posselt et al., 2018). These limitations have been identified in countries such as the Maldives, which presents key issues for the implementation of online and distance education involving the technological infrastructure and policies but also the need to offer upskilling opportunities to academic staff (World Bank Report, 2016). In addition, the supply of more flexible and accessible learning in Maldives also responds to the challenge of overcoming the dispersed geography of the country and the demand of equal and better opportunities for lifelong learning within the post-secondary population distributed across the islands.

This contribution builds on the AMED Erasmus+ capacity building project aiming at supporting the modernisation, accessibility and internationalisation of higher education in Maldives. The approach focuses on the professional development of MNU staff for the introduction of blended-learning as a core feature of the curriculum. A tailor-made learning program and a local institutional framework supporting its long-term sustainable implementation were designed for this purpose.

Understanding the needs for the learning program

The uniform look of the Envisioning will help the reader. Note that position and style of headings and subheadings should follow this example. No spaces should be placed between paragraphs. Please do not change any of the paragraph and font settings.

The design process began with a comprehensive training needs analysis targeting student, lecturer and institutional readiness for digital learning. It was carried out through key interviews conducted during the kick off-meeting to investigate administrative, managerial and

References

Damewood, A. M. (2016). Current trends in higher education technology: Simulation. *TechTrends, 60*(3), 268-271. https://doi.org/10.1007/s11528-016-0048-1

De Wit, H., Hunter, F., Howard, L., & Egron-Polak, E. (2015). *Internationalization of Higher eEducation.* EU Directorate-General for Internal Policies. https://www.europarl.europa.eu/RegData/etudes/STUD/2015/540370/IPOL_STU%282015%2954 0370_EN.pdf

Maina, M. F., Guàrdia, L., & Albert, S. (2019). Good practices in European Short Learning Programmes (E-SLP). In G. Ubachs (Eds.) *The Envisioning Report for Empowering Universities* (pp 6-8). EADTU. https://tinyurl.com/envisioning-report-2019

Maina, M. F., Guàrdia, L., Albert, S., Antonaci, A., Uotinen, V., Altinpulluk, H., Karolina, G., Chrząszcz, A., & Dunn, C. (2020). *Design guidelines for flexible and scalable SLPs* (Research Report No. 4.2). eSLP project. https://e-slp.eadtu.eu/images/D42_Guidelines_final.pdf

Posselt, T., Abdelkafi, N., Fischer, L., & Tangour, C. (20189). Opportunities and challenges of Higher eEducation institutions in Europe: An analysis from a business model perspective. *Higher Education Quarterly, 73*(1), 100–-115. https://doi.org/10.1111/hequ.12192

World Bank Report. (2016). *Country Partnership Framework for the Republic of Maldives for the Period FY16-FY19* (Report No. 103724-MV). http://documents.worldbank.org/curated/en/125521468195563512/pdf/103724-CPF-P157051-

strategic issues regarding an e-learning organizational strategy implementation with the Dean of Students, The Deputy Vice-Chancellor, the Quality Assurance Controller, and the Registrar. Additionally, a focus group with six lecturers from different Faculties and a focus group and a meeting with the CETE team (MNU center for teaching support) were also led with the purpose to gain insights into faculty e-learning readiness and training needs. Two questionnaires were validated during the kick-off and distributed later on to MNU lecturers and students to develop e-learning maturity profiles.

The results established a clear and accurate portrait of the situation of the university and the corresponding lecturers and senior-level staff training needs. An in-depth analysis of these findings provided enough information to design and develop the SLP curriculum.
For each training need a set of topics was identified and organised into a thematic concept map used as the basis for the design phase. As a result, the SLP was organized around four modules and two capstone projects divided into two pathways, for lecturers and for senior-level decision-makers, as follows:

- "Foundations of e-learning" (common to all)
- "Leadership and management of e-learning" (senior level)
- "Designing digital learning" (lecturers)
- "The networked teacher" (lecturers)
- "Capstone project" (one per profile)

Capstone projects build on the hands-on modules, extending the initiated tasks. The lecturer's capstone project delves into the design, development, and prototyping of a blended sequence or course. Senior level staff is oriented towards the development of a Faculty/institutional blended learning implementation action plan.

Discussion, interviews and focus groups with MNU representatives also revealed the need for creating a learning programme that would adapt to lecturers and senior-level staff schedules in terms of workload and flexibility. It was also established that each module would have 2.5 MNU credits, which correspond to 25 hours of work. Capstones projects were assigned 50 hours for senior level staff and 75 hours for lecturers.

Co-designing the AMED SLP

A co-design process was led by the Universitat Oberta de Catalunya (UOC) with the close participation of the other three partners (FOI and CARNET from Croatia, and MNU). The co-design adopted the primary design approach of starting from scratch and combined cooperative and collaborative work (Maina et al., 2020). As such, the development of each module was assigned to a module leader and a main contributor pertaining to different partner institutions. The peer design process undertaken to work on the assigned module was led through online co-designers working meetings organised according to emerging needs and left to the discretion of each co-design pair. The latest progression of their work was then submitted to a third partner institution which was assigned the role of reviewer and provided feedback on the work done. A set of design templates scaffolded the whole process.

The independent cooperation of every co-designer pair in the development of their module was combined with monthly group online meetings attended by all the members of the design team. These regular meetings were scheduled to discuss the design of the modules (description, topics, competences and learning outcomes, activities, resources, assessment and environment), ensure their coherence and

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dynamism, and avoid duplication of contents and activities (Maina et al., 2020).

Moreover, a protocol to structure the work dynamics for the co-creation of the SLP was set up by UOC envisaging all the issues to be tackled in the group online meetings. Among them were a) the assignment of roles (lead, contributor and reviewer), b) the discussion of the first draft of the topics, competences, learning outcomes and description of each module, c) the refinement of the content and style, d) the elaboration of guidance targeted to the facilitators of the program, e) the consolidation of the module design and, f) the implementation of the final modifications after the review of the partners and the relevant target group representatives. Capstone projects were directly connected to the modules and had to be designed in parallel with them. The role of the coordinator of the SLP design was to ensure progress and macro and micro design alignment. As such, UOC closely followed the entire process and elaborated a specific document to gather the progress in the design of each module's elements (description, topics, competences and learning outcomes, activities, resources, assessment and environment), thus enabling partners to check it against their expected achievements.

In addition, the coherence of each module with its learning path was reviewed by UOC which also worked to harmonise competences and learning outcomes and avoid dissonance in the design. The macro-design related to the complete educational strategy, the program's structure, the quality and the final credentialization, therefore, was increasingly aligned with the micro-design of its constituents. To make this objective possible, UOC also recommended that each module leader monitor possible overlap of topics, competencies, learning outcomes and content with other modules during the design phase, refining their content accordingly.

The result of this co-design process led to the deployment of the AMED e-Learning Study Programme which is currently being piloted at the Maldives National University with 75 lecturers and decision-makers.

Conclusion

This contribution presented the process of co-design of the AMED Study Program which involved a group of partners in a cooperative and collaborative development endeavour. The aforementioned process relied on a strategy that combined the co-design of the single learning blocks with monthly group online meetings to set common key milestones to be followed. The learning program which was developed and designed during this co-design process provides an outline of a potential sustainable e-learning model that could be rolled out across the Maldives. As such, this would contribute to the overall educational transformation towards a dual-mode university with the aim to provide quality higher education for those where until now it has not been possible.

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Lessons learned from Creation of Digitally Competent Educators SLP

Innovative impact

This European Short Learning Programme involves virtual collaboration from different perspectives: On the one hand for all partners as the joint development of an international course took place virtually with only one face-to-face meeting. On the other hand, as virtual mobility for the course participants providing the opportunity to join the course from all over the world. In addition, the combination of the course being integrated into the regular degree programmes of all partner universities and at the same time course being open for educators and non-degree students provides an attractive constellation for participants.

We all know that piloting offers much greater freedom and more opportunities for trial and error, the established collaboration can be considered a great success. The embedding of the course in existing degree structures, the different regulations of all four partner universities, as well as the additional opening of the course for the non-degree students to enrich collaboration within the course proved to be a challenge. Nevertheless, it proved to be one that can be overcome and that has an innovative impact in the long run not only for cooperation but for organizational flexibility concerning joint programmes.

Introduction

Mismatch of competences and socio-economical results of this issue is recognized as an important problem for higher education institutes (HEIs) in Europe. To cope with this issue HEIs need to create new more flexible and modular structures. In this context, a European HEIs are encouraged to create micro-credentials and short learning programmes (Futures et al., 2020).

European Short Learning Programmes (E-SLPs) are one of these new and flexible structures suggested by an EU Project funded under Erasmus+ Programme, Key Action 3: Support for Policy Reform, Initiatives for Policy Innovation, "Forward Looking Cooperation Projects". SLPs have potential to respond to market needs and to reduce mismatch of competencies. At best they provide flexible and scalable building blocks for degrees, are open with non-stop enrolment and offer flexible learning paths with progressive accreditation.

As an output of the e-SLP Project, the short learning programme Digitally Competent Educators (DCE) was developed by University of Jyväskylä (JYU), Finland, FernUniversität in Hagen (FeU), Germany, Universidade Aberta (UAb), Portugal and Anadolu University (AU), Turkey between years 2019-2020 (Truyen et al., 2020). The SLP is based on the Digital Competence Framework for Educators (DigCompEdu) published by Europeans Commissions Joint Research Center (Redecker, 2017). It combines six competence areas of the DigCompEdu and aims to develop and foster educators' digital competences in teaching and learning. The competence areas of the DigCompEdu framework were combined in a new innovative way in three modules each addressing a specific level of expertise within the framework – from newcomer to explorer, from explorer to integrator and from integrator to expert (Redecker, 2017). To speed up the planning process, this modification of DigCompEdu competence areas was originally suggested for the partners by the University of Jyväskylä.

The DCE programme is targeted at the continuous professional development and lifelong learning for educators at various levels and several education areas. It comprises three modules, covers EQF levels 6-8, is cumulative, flexible, fully online, and scalable. Each module equals 5 ECTS with a workload of 135 hours and a duration of 8 – 10 weeks. The programme is embedded into an existing degree programme at each of the partner university. In addition, separate

Comparable examples

In the context of the e-SLP project, another course that was also developed following a model with some similarities to our pilot is the SLP "Climate Change: from global to local Action". This SLP, resulted from a partnership between 3 universities and was also offered to an international audience. In the case of this pilot, each of the four modules was carried out in a different LMS (from the institution responsible for the module). More information here.

References

Dunn, C., Marr, L., Henderikx, P., Antonaci, A., & Ubachs, G. (2020). Recognition issues with regards to Short Learning Programmes. (Research Report No. 5). https://e-slp.eadtu.eu/images/publications_and_outputs/D5_Recognition_issues_with_regards_to_SLPs.pdf

Futures, H.S., Andersen, T. and Nedergaard Larse, K. (2020, December). Final report: A European approach to micro-credentials: Output of the micro-credentials higher education consultation group. European Commission. doi:10.2766/50302

Guàrdia Ortiz, L., Maina, M. F., Albert, S., Antonaci, A., Van Der Westen,S., Dunn, C. (2020). Compendium of patterns of good practices on flexible and scalable SLPs (Research Report No. 4.1). https://e-slp.eadtu.eu/images/publications_and_outputs/D41_Compendium_final.pdf

Maina, M.F., Guàrdia Ortiz, L., Albert, S., Antonaci, A., Uotinen,V., Altinpulluk, H., Karolina, G., Chrząszcz, A.,

modules can be completed individually or as certified SLP. In this paper, we present the lessons learned from a 2 years' experience of collaboration, communication, and administration of DCE short learning programme in an international setting.

From Planning to Implementation

Planning and ongoing communication is a key element while developing an international course. The first steps were focused on building a mutual understanding related to a set of aspects that are indispensable for the execution of the project. To facilitate decision-making processes, Microsoft Teams tool was chosen as a platform for communication. We met face to face only once in the beginning of the pilot, and rest of the communication happened in Teams. Objectives, learning outcomes, and learning activities of the SLP were designed together in Padlet. Discussion was active and forward-going within the virtual setting. A Teams channel for each module was created for specific contents of each module.

The second step was to decide who takes responsibility of which module. University of Jyväskylä was the main coordinator and responsible of the administration. The responsibilities for the content, pedagogical actions and guidance of each module were divided as follows: Module 1 FeU, Module 2 AU and Module 3 UAb. After this division, the decision had to be made whether we use one or several Learning management systems (LMS) when delivering the SLP to students. It was decided that the three modules were offered in the same LMS, Moodle of the University of Jyväskylä.

Following the guidelines of the E-SLP project (Melai et al., 2020), the third step was to start the preparations for the long-term and more established partnership. Each of the universities followed their own internal accreditation procedures for the SLP and defined the rules for integrating them into existing formal programmes.

It was also decided that each module was awarded a certificate (5 ECTS) by the responsible institution, with the university of Jyväskylä (coordinator) awarding the certificate for the entire SLP. This strategy made it possible to streamline the accreditation processes, following the particularities of each university, thus overcoming one of the problems that usually arise in these contexts (Dunn et al., 2020).

Running the Modules

Since the DCE Short Learning Programme is very much based on the exchange and collaboration between the participants, we found out that it is essential to group learners from different countries and cultural backgrounds. And as it reaches out for different proficiency levels of the learners, modules were built cumulative, from Module 1 to Module 3. In addition, each module was designed in a scalable way allowing an unlimited number of participants. This decision had implications at several levels. For example, the tutoring work would focus only on generic guidelines, without intervention in the discussion of the contents. Still, the teaching approaches and the pedagogies supported an inquiry-based and active learning approach of the

Dunn, C. (2020). Design guidelines for flexible and scalable SLPs (Deliverable 4.2)

(Research Report No. 4.2). https://e-slp.eadtu.eu/images/D42_Guidelines_final.pdf

Melai, T., van der Westen, S., Winkels J., Antonaci, A., Henderikx, P., & Ubachs, G. (2020). Concept and role of Short Learning Programmes in European higher education. (Research Report No. 02.1). https://e-slp.eadtu.eu/images/Concept_and_role_of_SLPs.pdf

Redecker, C. (2017). European Framework for the Digital Competence of Educators: DigCompEdu (Y. Punie, Ed.). Publications Office of the European Union. https://doi.org/10.2760/159770

Truyen, F., Paklons,A., Caeiro, S., Curto, M., Gmelch, N., Romano, E., Kananen, P., Antonaci, A., Henderikx, P., & Ubachs, G. (2020). Report on collaborative SLPs and related mobility (Research Report No.6.2 https://e-slp.eadtu.eu/images/publications_and_outputs/D62_Report_on_collaborative_SLPs_and_related_mobility.pdf.

students (Guàrdia Ortiz et al., 2020). Also, in terms of the design of the three modules, we created a clear learning path for the students, with a sustained progression and workload suitable for adult learners. In relation to the evaluation, we opted for diversified forms of assessment.

After piloting of all Modules, and analyses of anonymous student feedback and teacher experiences, we decided to implement a more collaborative approach between the partners. It allowed us to better gain a shared understanding of quality and quality development within the programme. Co-teaching was implemented in all three modules, including one teacher from the module developing partner and one teacher from the coordinator. Further development of each module regarding course design, content and pedagogy led to a more coherent overall picture of DCE.

Conclusion

It is crucial in international partnerships to create stable structures for collaboration and communication and have a clear division of labour and partner roles. In this sense, the planning and implementation of the SLP has been a very important and intense phase. Running the SLP in several rounds has further intensified our collaboration, by using and adapting Moodle as LMS, by developing model cross-partnership co-teaching that helped us not only to further develop the courses but also a to get a coherent overall picture of DCE. Finally, the administration that is set at one place at the coordinating institution together with the LMS.

After the pilot phase of the SLP was completed, we made a very positive assessment of the work done and decided to move on to a new phase of consolidating the partnership: To have the SLP as virtual mobility anchored in degree programmes at each partner university. The cooperation agreements are signed, the programme committee including all four partner institutions is set: so the joint work can and will continue after the end of project.

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Research on SLPs implementation: Recommendations for the UE and National Governments

Innovative impact

The following research concludes with a set of recommendations aimed to be the starting point for the design of the path to follow for change towards systemic and sustainable institutional, governmental and EU policies and strategies for continuous education, mainstreaming SLPs as specific areas of university provision next to degree education and open education, and Microcredits as a tool to facilitate recognition procedures. It provides an updated overview of the current European situation at different levels in regards to CE/CDP which allow to identify both constraints and strengths of the present system. Additionally, it contributes to make SLPs opportunities visible by promoting their stack ability and flexibility for universities and companies at national and regional level.

Introduction

Within the ongoing European Short Learning Programms Project (E-SLP), Universidad Nacional de Educación a Distancia (UNED) along with EADTU have carried out a deep research for stablishing a set of recommendations to UE and National Governments for a consensual transition and implementation of the Short Learning Programmes at European level. Starting E-SLP project´s assumptions were considered: the need of HEI´s to have more flexible offering to respond to mismatches of skills and competences; and the need to reach mutual recognition agreements among HEI´s according to the European Qualification Framework (EQF) and Standards and Guidelines for Quality Assurance due to the various recognition procedures identified across Europe. Interviews to institutional and governmental representatives were performed for the identification of current policies and strategies concerning online Continuous Education (CE) and Continuous Professional Development (CDP) and their relation to SLPs, Microcredential programmes, and MOOC-based programmes, among others. Additionally, information about how the strategies are anchored in each country´s higher education system was gathered as well as possible visions and plans on the future of CE/CDP. Lastly, data discussion and recommendations are presented.

Methodology

The interviews were performed in the first semester of 2020. The analysis used a qualitative and descriptive method. In a first phase, digital transcripts were processed in order to identify the main semantic clusters, and in the second stage, the clusters identified were categorized based on guidelines by Miles and Huberman (1994). The descriptive and qualitative part of the study was developed according to "data reduction" and "data categorization" methods, which allow to simplify and select information for it to be more manageable. Consequently, "synthesis and grouping processes" were applied, resulting into the most representative categories, becoming into meta-categories in the final categorization.

Sample and procedure

The sample consisted of the fourteen E-SLP partner institutions. They were requested to conduct three different interviews: 1) at the institutional level; 2) at the accreditation agency level and 3) at the governmental level. Due to the Covid-19 outbreak, some of the partners did not manage to reach out the interviews (n=12): The Open University (OUUK); Anadolu University (AU); Universidade

References

Aris Redó, N., & Comas, M. À. (2011). Lifelong Learning in the Context of the European Area of Lifelong Learning. *International Journal of Educational Technology in Higher Education, 8*(2), 172-180.

Bjørnåvold, J. (2007). The potential impact of the European Qualifications Framework (EQF) on systems for validation of non-formal and informal learning. In Duvekot, R., Scanlon, G., Charraud A.M., Schuur, K., Coughlan, D., Nilsen-Mohn, T., Paulusse, J., & Klarus, R. (Eds.). *Managing European diversity in lifelong learning. The many perspectives of the Valuation of Prior Learning in the European Workplace* (pp. 79-94). HAN University, Foundation EC-VPL & Hogeschool van Amsterdam.

Dunn, C., Marr, L., Henderikx, P., Antonaci, A., & Ubachs, G. (2020). Recognition issues with regards to Short Learning Programmes. (Research Report No. 5)

EADTU. (2015). *Memorandum of Understanding Between the European open and distance teaching universities on Short Learning Programmes*. Maastricht: European open and distance teaching universities.

European Commission (2020). *European skills agenda for sustainable competitiveness, social fairness and resilience.* Publications Office of the European Union.

Gaebel, M., Zhang, T., Bunescu, L., & Stoeber, H. (2018). *Trends 2018: Learning and teaching in the European Higher Education Area*. Brussels: European

Aberta (UAb); Universitat Oberta de Catalunya (UOC); Open University of Cyprus (OUC); AGH University of Science and Technology (AGH-UST); UNED; Open Universiteit (OUNL); University of Jyväskylä (JYU); Università Telematica Internazionale (UNINETTUNO); Fernuniversität in Hagen (FernUni) and Hellenic Open University (HOU). One representative for each partner institution performed the interview(s) involving one or more representatives of the three levels mentioned above. Interviews were in semi-structured format and the questions were shared online with E-SLP partners who were supposed to perform them face to face, however, other means were allowed (videoconferencing tools) due to the Covid-19 outbreak.

Structure of the Analysis of the interviews

The analysis took as reference the meta-categories and categories stablished on the interview. The first part was devoted to explore the answers provided by institutional and accreditation offices, the following topics and subtopics were reflected:

-Policies and strategies: institutional strategy to invest on SLPs; combination of online SLPs and degree education; barriers in the development of SLPs at institutional level; connections with the labour market; contribution to competences on the labour market; relation with the Sustainable Development Goals in Education (SDG 4); target of having 25% of the population engaged in lifelong learning.

-Recognition: multilateral agreements for SLPs recognition; willingness about the recognition of SLPs coming from E-SLP partners; issues to be considered in the possible agreements on recognition; recognition of prior learning and experience; quality assurance practices and alignment with the Standards and Guidelines for QA in HEI´s; SLPs modules size recognition; SLPs inclusion in HE procedures; SLPs certification value for public job competitions; SLPs recognition involving ECTS and EQF level.

-Qualifications/Awards: types of qualifications/awards; differences between certifying SLPs and MOOCs; grading SLPs; SLPs stack ability to larger degree programmes/modular academic degree programmes.

Secondly, answers from governmental authorities were analysed following the same procedure, topics and subtopics resulting were:

-Awareness raising

-Policies development and framework building: governmental policies development; governmental monitoring; governmental strategies development; governmental and university authorities SLPs discussion.

-Specific legal regulation

-Funding rules: CE inclusion in the funding rules for HE and governmental funding provision; agreements between the governmental and HEI´s for CE/CDP funding; funding related to agreements with social partners or sectoral organizations

University Association.

Melai, T., van der Westen, S., Winkels J., Antonaci, A., Henderikx, P., & Ubachs, G. (2020). Concept and role of Short Learning Programmes in European higher education. (Research Report No. 02.1).

Miles, M., & Huberman, A. (1994). *Qualitative data analysis: An expanded sourcebook*. sage.

Schoeters, P., Van Herck, R., Hauch, A., Aarkrog, V., Høyrup, S., Haltia, P., Nyyssola, K., Aribaud, M., Lambkin, A., Tamayo, M.A., Anda, M.L., Van Raai, R., Feenstra,B., Doyle, J., Soares, C., Ignjatovic, M., Lindén, C., Dick, J., Rodger, S., & Sakamoto, A. (2004). *The Role of National Qualifications Systems in Promoting Lifelong Learning. An OECD activity. Report from Thematic Group 2: Standards and quality assurance in qualifications with special reference to the recognition of non-formal and informal learning*. París: OECD.

Thaler, I., & Bastiaens, T. J. (2017). EADTU taskforce short learning programmes final report. EADTU.

Witthaus, G., A, I. d., Childs, M., Tannhäuser, A., Conole, G., & Nkuyubwatsi, B. (2016). *Validation of Non-formal MOOC-based Learning: An Analysis of Assessment and Recognition*. European Union.

UNESCO (2015). *The role of higher Education in Promoting Lifelong Learning.* Hamburg: UNESCO Institute for Lifelong Learning

Data discussion

In regards to the institutional strategies in relation to SLPs three areas of development are identified: the development of short professional courses or/and specialized professional training for students or workers as part of their educational offerings; modular teaching with microcredits and a structure based on Microcredentials and hybrid programmes which combine online SLPs and formal education. These developments are in line with the European Commission recommendations and with its work plan priorities (2020). Relevant barriers to these purposes are: financial constraints; quality assurance; dialogue with stakeholders and the lack of incentives for teaching staff. In relation to SLPs promotion and development contributing to Lifelong Learning (LLL) it is deducted how SLPs have the potential to support the achievement of the European target of 25% of people engaged in LLL by 2025 (EU and SDG4). SLPs, from their concept, aim to connect educational institutions and the labour market, so they can contribute to this paradigm shift. Moreover, participants expressed the possibility to build a common framework for the recognition of SLPs supported by Bologna tools, which implies the use of ECTS to certify the learning outcomes and alignment to an EQF/NQF level. The EQF covers all existing qualification levels, so they contribute to the permeability of systems and provides a validation framework for educational stakeholders. An SLP in its definition can comply with the Microcredential definition as promoted by the EU. Building SLPs according to modular structure based on MCs can respond to the need of creating a system of recognition of SLPs allowing students to design flexible programs and recognition would be ensured not only within a university but also between universities.

On the other hand, from the governmental perspective it seems clear that LLL needs to be promoted increasing public awareness, something that is not detected on the results at a large scale, where this topic is not always an explored path. Therefore, a clear commitment from national and European Institutions is needed in cooperation with university institutions. Another matter of interest is the funding rules applied to CE which turn out to be quite low in Europe in comparison with other countries. Following UNESCO proposals on this topic and discussing them at European and National levels is a top priority.

Conclusion

It is recommended to integrate and recognize CE through SLPs and Microcredentials in the Bologna process. Meanwhile, multilateral agreements among institutions on common frameworks should be stimulated to assure recognition of SLPs and promote the organization of CE, employability and inclusion in a competitive world. For making this happen, Bologna tools for defining Microcredential and SLP qualifications should be used. This should be accompanied by the improvement of the funding related to Microcredentials and SLPs and the creation of a permanent dialogue in order to involve all stakeholders for CE. Lastly, it is proposed to link Microcredential and SLPs to Target 4.7 of the Sustainable Development Goals determined by the United Nations in 2015 ensuring that all learners can develop personally, professionally or academically.

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Integrating MOOCs into Formal Curricula and Courses

Innovative impact

The MODE-IT project supports educators on integrating MOOCs or MOOCs-based pedagogies into their regular courses and programs. As a part of the project, a MOOC was developed to offer training to educators in all levels. The course was designed based-on competence-based learning, students-centred education. It has 5 modules, and each has several lessons. These modules directly address the competence areas and each lesson targets one learning objective of the module (actually one competence). Also, each lesson covers a list of tasks (activities) the participants should complete, including actively watching video lectures, reading supporting materials, interacting with their peers. In other words, whole course consists of activities the learners should accomplish.

Introduction

Massive Open Online Courses (MOOCs) are "courses designed for large numbers of participants, that can be accessed by anyone anywhere as long as they have an internet connection, are open to everyone without entry qualifications, and offer a full/complete course experience online for free" (EADTU, 2015, p. 1). For some, like Martin Bean, former CEO of Open University of UK, mentioned in a personal interview, MOOCs are not new but just proof of acceptance about what open universities have been doing for decades, and technology-based versions of open universities' courses. Whether new or not MOOCs does not only offer flexible learning opportunities for those who wish to but also provide some innovative teaching strategies for implemented in regular programs and courses as well as business models for higher education institutions to adopt. This paper introduces an ongoing Erasmus+ project, abbreviated as MODE-IT that intends to explore ways to use MOOCs or MOOC-based pedagogies into regular online courses and programs. Following sections of the paper provide an insight about the project and summarize the lessons learned so far.

MODE-IT

Curricular modernization by implementing MOOCs model, or MODE-IT is an Erasmus+ Project that intended to explore and to provide training to educators on integration of MOOCs and MOOC-based pedagogies into formal courses and programs. Opening up education to all has been one of the priorities of European Commission and considered as a mean to build knowledge-based society.

The MODE-IT project seeks to support the Europe's Opening up education policy through leveraging MOOCs potentials and tackling challenges faced by MOOCs developers and learners. Fachhochschule Des Mittelstandes (FHM) GNBH – University of Applied Sciences from Germany, Anadolu University from Turkey, Kauno Technologijos Universitetas from Lithuania, Universitatea Politehnica Timisoara from Romania, and Instituto Politecnico do Porto from Portugal came together to meet this goal. More specifically, the objectives of the MODE IT project are (1) to boost HEI educators' awareness and skills for MOOCs design and delivery; (2) to develop innovative MOOCs-based instructional approaches for curriculum design; and (3) to raise awareness of learners for and improve their learning experiences through MOOCs. To achieve the above objectives, the following outputs will be designed, tested, and implemented during the project lifetime:

Online Self-Assessment Tool - This tool allows educators identify current status of their pedagogical skills related to the MOOCs design and

Reference

European Association for Distance Teaching Universities (EADTU) (2005). Definition of Massive Open Online Courses (MOOCs). Retrieved at https://www.openuped.eu/images/docs/Definition_Massive_Open_Online_Courses.pdf

More info about MODE-IT

Website: https://www.mode-it.eu

Facebook: https://www.facebook.com/euprojectmodeit/

Twitter: https://twitter.com/euprojectmodeit

delivery. Users of this tool get personalized feedback on their level of each competency as well as suggestions for improvement. The tool also directs the users to the module(s) and lesson(s) of a MOOC designed and developed in the scope of the project. During the development of the tool, a series of focus group studies as well as interviews with experts and intensive literature review were conducted. As a result, 27 competencies were identified and categorized into 5 areas: pedagogical competences for designing student-centred learning, MOOCs specific competences, technology-related competences, competences related to the theoretical foundations of MOOCs, and competences about MOOC integration into formal learning. In order to identify the competence levels, Bloom's Revised Taxonomy was used. In other words, for each competence six statements, each of which addressing a level in the taxonomy (remember, understand, apply, analyse, evaluate, create), were generated and the users were asked to indicate their perceived level of possessing the competence. The tool was translated into five languages (English, German, Lithuanian, Portuguese, and Turkish) and currently in the piloting phase with voluntary participation of the educators from five partner countries.

Open Online Training Program – This program actually consists of a MOOC targeting the competencies identified during the first phase (intellectual output) of the project, namely Self-Assessment Tool, and intends to support educators in redesigning existing courses into MOOCs, designing new MOOCs, integrating MOOCs into existing formal curricula, creating personalized learning environments, and successful delivering MOOCs-based study programs. It is designed itself as MOOC promising a few benefits to wider international teacher community such as flexibility, open access, and direct immersion into MOOCs approaches through learning via MOOC. The training program is closely linked to the self-assessment tool: based on the assessment results, participants are recommended either to take advantage of separate module(s), lesson(s) covering the missing knowledge and skills or to complete the whole MOOC.

Redesigned MOOCs-based courses, programs or stand-alone MOOCs - The innovative techniques on redesigning curricula through integrating MOOCs into study programs will be piloted at 5 participating HEIs. Participant educators that tested and completed the developed training program (IO2) will demonstrate the acquired skills through aligning their traditional teaching and learning strategies with the MOOC approach. Educators will design new teaching and learning scenarios for the open online environments considering student-centred approach, virtual collaboration, and similar pedagogical approaches. The piloting phase of the redesigned curricula/courses will target:

- formal students at participating HEIs. In this manner, they can benefit from flexible innovative learning formats, increase their digital skills, and boost their self-directed learning competence.
- non-formal learners (professionals, adults). Doing so, HEI services will be opened to wider audience.

Through the interplay of these 2 strategies, a greater impact towards promoting open learning, social inclusion, and increasing access to HEI for all will be promoted.

Lessons Learned (So Far)

The project is still going on, at the second phase now. So, the real results have not observed yet, but a few important experienced have been gained so far. For instance, although there are several commonly accepted frameworks on competencies, such as The European Framework for the Digital Competence of Educators (DigCompEdu), it is still difficult to identify which competencies the HEIs really needs, and to establish a common consensus on the definitions of these competencies and some other concepts. Student-centred learning, for example, is a concept used quite frequently but in different meanings. So, one of the challenges for us was to develop commonly accepted operational definitions of the competencies and concepts. We spent a considerable amount of time on this challenge but as a result reached a list of definitions that can be used as a reference.

Another significant lesson was about the design of the modules of the teacher training MOOC. The partners agreed on designing the modules, lessons and activities based-on competencies. This design can also be used as an example for competence-based, student-centred learning approach. The training course has 5 modules, and each has several lessons. These modules directly address the competence areas and each lesson targets one learning objective of the module (actually one competence). Also, each lesson covers a list of tasks (activities) the participants should complete, including actively watching video lectures, reading supporting materials, interacting with their peers. In other words, whole course consists of activities the learners should accomplish. This modular design supports both competence-based learning and student-centred teaching approaches.

As a conclusion, we strongly believe in that the MODE-IT project will not only support educators on integrating MOOCs or MOOCs-based pedagogies into their regular courses and programs but also will be a best practice for how to integrate these pedagogies into a MOOC on professional development of educators.

Contributing Institutions

Anadolu University | Turkey
Dublin City University | Ireland
European Association of Distance Teaching Universities | The Netherlands
FernUniversität in Hagen | Germany
Hellenic Open University | Greece
Norwegian University of Science and Technology | Norway
Rheinisch-Westfälische Technische Hochschule | Germany
Smartlearning | Denmark
Tampere University of Applied Sciences | Finland
The Open University | The United Kingdom
Universidade Aberta | Portugal
University College Dublin | Greece
Università Telematica Internazionale Uninettuno | Italy
University of Jyväskylä | Finland
Universidad Nacional de Educación a Distancia | Spain
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