



16 - 18 October

# OOFHEC2019

"BLENDED AND ONLINE EDUCATION WITHIN  
EUROPEAN UNIVERSITY NETWORKS"

the Online, Open and Flexible Higher Education Conference

## Conference Proceedings

Hosted by UNED, Madrid (Spain)



## "Blended and online education within European university networks"

Overview of papers on Higher Education for the Future as presented during the Online,  
Open and Flexible Higher Education Conference in Madrid, October 2019

Editors

George Ubachs | Managing director EADTU  
Fenna Joosten-Adriaanse | Event Organiser EADTU

**EADTU, October 2019**

ISBN: 9789079730414

**License used:** This work is licensed under a Creative Commons Attribution 4.0 International License: <https://creativecommons.org/licenses/by/4.0/>. This license lets others distribute, remix, tweak, and build upon this work (even commercially) as long as credit is provided for the original creation. This is among the most accommodating of CC licenses offered and recommended for maximum dissemination and use of licensed materials.



**Disclaimer:** The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.



Co-funded by the  
Erasmus+ Programme  
of the European Union

## Message of Madrid

OOFHEC 2019, 18 October 2019, Madrid

### Key developments in European higher education

We witness key developments in European higher education which affect and even transform teaching and learning in degree education, continuing education and professional development, and open education (OERs and MOOCs).

EADTU and the members – a community of ten open universities and more than 200 front-runner universities in blended and online flexible education for adult citizens - play a key role in supporting each of these developments sharing their best experience and expertise, contributing to excellence, innovation and inclusion which are the core values in EU policies for higher education and for the European Education Area.

### The European universities initiative

In December 2017, the Heads of State of the EU have taken the European Universities Initiative. The ambition is immense: against 2025 some 30 university alliances will be mobilized all over Europe to which hundreds of universities belong, with a spread all over Europe.

The universities involved organize close educational collaborations and innovative pedagogies in main fields of studies. Within these new educational eco-systems, students can build their own curriculum benefiting from new formats for physical, blended or virtual mobility.

Although the main focus of these alliances is on mainstream degree education, they take also initiatives in continuing education and open education. They explore the field, e.g. by short postgraduate programs, MOOC-based micro-credential programs and other innovative formats as well as sharing open educational resources. However, for most institutions, lifelong learning is still an unexplored world and therefore more of a challenge.

This needs further reflection in view of the European society, its economy and citizens facing longer and changing careers. European flexible distance universities can be inspirational in this respect as they have developed pedagogies, innovative courses and student services for a large-scale approach to the wide educational needs of adult learners, not only in terms of students' numbers but also of personalisation at scale.

Next to this, flexible distance education institutions will continuously adapt their strategies to the new challenges faced by European learners. They seek even a closer collaboration with each other and with the entire field of lifelong learning in Europe in order to meet their needs. This also will lead to multidisciplinary, problem-oriented programs awarding micro-credentials and to (blended/virtual) mobility between institutions.

### The EU.University hub

EADTU and the members are already supporting the European Universities initiative as they are involved in building the eU.University hub in the OpenU project, developing with others the educational framework for educational innovation, blended and online collaboration and mobility for it.

The hub will serve as a one stop-shop for digital higher education. It will establish a single point of access for online learning in Europe, putting online courses and resources at the fingertips of students. It will also provide models and guidelines for collaborative courses and mobility, supporting the European

Universities alliances. Finally, it will create a digital infrastructure for streamlining administrative processes for collaboration and mobility.

This will bring EU added value to digital developments taking place in higher education across Europe.

### Continuing education / CPD

Fact sheets of the European Commission show that neither the EU participation levels for higher education nor for lifelong learning are achieved and that there still are dramatic differences between member states.

The employment rates of recent graduates in tertiary education are still below 90% and even below 80% in many European countries<sup>1</sup>. But, according to most recent European statistics, the participation rates to lifelong learning in European countries varied from below 3% to plus 25%<sup>2</sup>.

Appropriate educational provisions such as flexible short learning programs (blended or online) can keep innovative knowledge and skills of the workforce up to date European-wide. They can more rapidly and at a large scale respond to needs in the wider economy and they can anticipate on careers of tomorrow. The lifelong journey of learning is not yet supported by universities as institutional policies and strategies are not in place. Services to working learners and flexible delivery models are to be implemented through extension schemes for continuing education.

If no new continuing higher education provisions at scale are created, employers will keep facing problems with recruiting workforce with the right qualifications. All eight EU key competences for lifelong learning should be envisaged: science, technology, engineering, mathematical skills; languages; literacy; cultural awareness and expression; sense of initiative and entrepreneurship; social and civic competence; personal, social and learning competences; and digital competences<sup>3</sup>.

Universities are aware of this. But the median age of students is not far away from 19 years, almost in all European countries. They should also act. There are signs that some front-runner universities

---

<sup>1</sup> Employment rates of recent graduates (aged 20–34) not in education and training, by educational attainment level, 2018 (%).png

[https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Employment rates of recent graduates \(aged 20–34\) not in education and training, by educational attainment level, 2018 \(%25\).png](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=File:Employment_rates_of_recent_graduates_(aged_20–34)_not_in_education_and_training,_by_educational_attainment_level,_2018_(%25).png)

<sup>2</sup> Adult participation in learning, 2013 and 2018 (1) (% of the population aged 25 to 64 in the last 4 weeks).png. See:

[https://ec.europa.eu/eurostat/statistics-explained/images/2/20/Adult\\_participation\\_in\\_learning%2C\\_2013\\_and\\_2018\\_%281%29\\_%28%25\\_of\\_the\\_population\\_aged\\_25\\_to\\_64\\_in\\_the\\_last\\_4\\_weeks%29.png](https://ec.europa.eu/eurostat/statistics-explained/images/2/20/Adult_participation_in_learning%2C_2013_and_2018_%281%29_%28%25_of_the_population_aged_25_to_64_in_the_last_4_weeks%29.png)

<sup>3</sup> See: Proposal for a Council recommendations on key competences for lifelong learning. <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52018SC0014&from=EN>

See also: A. Ferrari, Y. Punie and B. Brecko, Digcomp: a framework for developing and understanding digital competence in Europe, Publication Office of the EU, 2013.

<https://ec.europa.eu/jrc/en/publication/digcomp-framework-developing-and-understanding-digital-competence-europe>



develop strategies for continuing education and MOOCs, which should rapidly be followed by universities in all European countries. In general, governments don't follow yet, not seeing the opportunities from an educational and employment perspective.

Support of the European Social Fund should be envisaged in some countries, certainly in countries with low participation rates.

### **Open education: from MOOCs to MOOC programs**

In 2017, the European MOOC Consortium (EMC) was established associating the main European MOOC platforms: Futurelearn (the Open University), France Université Numérique (FUN – agency of the French government), Miriadax (Telefonica in collaboration with Spanish Rectors' Conference and Ibero-American universities) and EduOpen (16 Italian universities) and the OpenupEd partnership (EADTU). The EMC represents most of the MOOC development work in Europe by offering together more than 1000 MOOCs. The European MOOC platforms cover networks of in total 280 universities in a variety of European countries and languages areas.

MOOCs are there to stay. We see even new developments. MOOC-based programs are created, leading to a variety of qualifications like MicroMasters, nanodegrees, graduate certificates, graduate diplomas, etc. Inconsistency in these qualifications and in other continuing education programs leads to confusion. Clarity about this is of utmost importance for learners, universities and employers. Therefore, the European MOOC Consortium developed a Common Micro- Credential Framework.

In this framework, a common approach is agreed by which micro-credentials have a total study time of no less than 100 hours and no more than 150 hours (4-6 ECTS). They are levelled at level 6 or Level 8 in the European Qualification Framework (bachelor or master level).

It provides a transcript that sets out the course content, learning outcomes, total study hours, EQF level and number of credit points (ECTS) earned.

The purpose is to make qualifications more readable and understandable across different countries and systems by learners, universities and employers.

### **EADTU and these developments**

EADTU and the members have always been at the edge of educational progress.

The guiding principle of open universities has been mass-personalisation: excellence and inclusion in innovative teaching and learning environments.

Open and distance teaching universities have had a large impact on national higher education systems by developing new modes of teaching and learning along with new technologies for education as they came up.

During the long existence, EADTU contributed to educational developments through European projects with a transnational impact. Also today, we contribute the European challenges just mentioned. EADTU keeps cooperating with the entire community of European universities to make European higher education accessible and high quality for all.

## Keynote speakers

We thank our keynote speakers for their inspiring contributions to the OOFHEC2019 Conference.



Ricardo Mairal

Rector Magnificus at UNED  
(Spain)



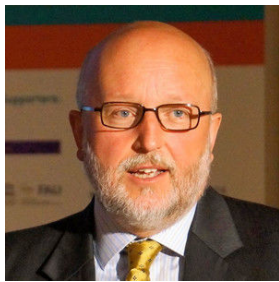
Pastora Martínez Samper

Vice President Globalization  
& Cooperation at UOC  
(Spain)



Liz Marr

Pro-Vice-Chancellor at OUUK  
(United Kingdom)



Dirk van Damme

Senior Counsellor at  
OECD/EDU  
(France)



Willem van Valkenburg  
Manager Teaching & Learning  
Services at  
Delft University of  
Technology  
(The Netherlands)



Francesca Helm  
Researcher  
University of Padova  
(Italy)



Melissa Highton

Director of Learning,  
Teaching and Web Services at  
University of Edinburgh  
(United Kingdom)



Stefaan Hermans

Director of Policy Strategy  
and Evaluation at the  
European Commission  
(Belgium)



Jesús G. Boticario

Vice-Principal Digitalization &  
Innovation at UNED  
(Spain)



**Maria Gravari-Barbas**  
Vice-President, Université  
Paris 1 Panthéon-Sorbonne  
(France)



**Theo Bastiaens**  
Rector Magnificus  
Open Universiteit  
(The Netherlands)



**Matthew Hodges**  
Telefónica Educación Digital  
(Spain)



**Pierpaolo Limone**  
Rector Magnificus  
Università di Foggia  
(Italy)



**Catherine Mongenet**  
CEO of FUN  
(France)



**Yves Punie**  
Deputy Head of Unit and  
Senior Researcher at  
European Commission  
(Spain)



**Uwe Elsholz**  
Head of the Department of  
Lifelong Learning at the  
Institute for Education and  
Media Research  
(Germany)



**George Ubachs**  
Managing Director  
EADTU  
(The Netherlands)

**Organising Committee**

EADTU | George Ubachs, Fenna Joosten-Adriaanse  
UNED Madrid, Spain | Monica Sarabia, Sebastián Rúben Gómez Palomo

**Programme Committee**

Ada Pellert, FernUniversität in Hagen, Germany  
Andreas Janko, Johannes Kepler Universität, Linz, Austria  
Andrzej Wodecki, Polish Virtual University, Poland  
Arne Kjaer, Danish Association of Open Universities, Denmark  
Carla Oliveira, Universidade Aberta, Portugal  
Danguole Rutkauskiene, Kaunas University of Technology, Lithuania  
George Tsimouris, Hellenic Open University, Greece  
Jan Kusiak, AGH - University of Science and Technology, Poland  
Jean-Marc Meunier, Fédération Interuniversitaire de l'Enseignement à Distance, France  
Josef Reif, Johannes Kepler Universität, Linz, Austria  
Josep Planell, Universitat Oberta de Catalunya, Spain  
Jukka Lerikkanen, University of Jyväskylä, Finland  
Kobi Metzger, Open University of Israel, Israel  
Liz Marr, The Open University, United Kingdom  
Lucie Rohlikova, Czech Association of the Distance Teaching Universities, Czech Republic  
Magalie Soenen, StoHO- Studiecentrum Open Hoger Onderwijs, Belgium  
Marc Bors, FernUni Schweiz, Switzerland  
Maria Amata Garito, Uninettuno - International Telematic University, Italy  
Mark Brown, National Institute for Digital Learning, Ireland  
Marko Papic, Slovenian Rectors' conference, Slovenia  
Paulo Dias, Universidade Aberta, Portugal  
Pierpaolo Limone, Università di Foggia, Italy  
Ricardo Mairal Usón, Universidad Nacional de Educación a Distancia, Spain  
Safak Ertan Comakli, Anadolu University, Turkey  
Santiago Acosta Aide, Universidad Técnica Particular de Loja, Ecuador  
Sokratis Katsikas, Rector of the Open University of Cyprus, Cyprus  
Teija Lehto, Tampere University of Applied Sciences, Finland  
Theo Bastiaens, Open University, The Netherlands  
Uwe Elsholz, FernUniversität in Hagen, Germany  
Vidar Pedersen, International Cooperation & Quality Enhancement in Higher Education, Norway



# Table of Contents

<b>"A little muddled and in need of greater clarity": encouraging formative use of an online Academic Writing Toolkit</b>	<b>1</b>
<i>Ms. Irene O'Dowd (Hibernia College)</i>	
<b>Analytics for tracking student engagement</b>	<b>15</b>
<i>Mrs. Christine Gardner (The Open University), Dr. Allan Jones (Open University), Mrs. Helen Jefferis (Open University)</i>	
<b>Attesting and certifying university teachers' professional and digital competencies</b>	<b>25</b>
<i>Dr. Marianne Helfenberger (Distant University), Prof. Paz Prendes Espinosa (University of Murcia), Dr. Isabel Gutiérrez (University of Murcia)</i>	
<b>Beyond the VLE: Transforming Online Discussion and Collaboration Using Microsoft Teams</b>	<b>36</b>
<i>Mr. Edmund Hewson (Leeds Beckett University), Ms. Gar Wai Chung (Leeds Beckett University)</i>	
<b>Blended learning in industrial design</b>	<b>48</b>
<i>Prof. Iris A. Domínguez (Universidad Nacional de Educación a Distancia - UNED), Dr. María del Mar Espinosa (Universidad Nacional de Educación a Distancia - UNED), Dr. Luis Romero (Universidad Nacional de Educación a Distancia - UNED), Dr. Manuel Domínguez (Universidad Nacional de Educación a Distancia - UNED)</i>	
<b>Building learning analytics cMOOC for teachers and learning designers through online collaboration between universities</b>	<b>61</b>
<i>Mr. Seppo Nevalainen (Karelia University of Applied Sciences), Dr. Sami Suhonen (Tampere University of Applied Sciences), Mr. Jukka Kurttila (Oulu University of Applied Sciences), Ms. Riikka Muurimäki (Seinäjoki University of Applied Sciences)</i>	
<b>Challenges of University teaching in the construction of collaborative learning spaces in distance education</b>	<b>73</b>
<i>Prof. Andrea Melissa Mora Umaña (Universidad Estatal a Distancia de Costa Rica)</i>	
<b>Collaboration, communities and Open Education.</b>	<b>82</b>
<i>Dr. Frank de Langen (Open University)</i>	
<b>Collection of MOOC</b>	<b>86</b>
<i>Dr. Pierre Rolin (imt), Mr. Denis Moalic (IMTA), Dr. Remi BADONNEL (Université de Lorraine, LORIA / INRIA,), Mr. Olivier BERGER (Télécom SudParis), Ms. Jihane FOUZAI (Laboratoire BONHEURS, Université Cergy-Pontoise)</i>	
<b>Connecting educational resources to "all in one" distance learning and teaching: the CANVAS pilot project</b>	<b>101</b>
<i>Prof. Maria Teresa Bendito Cañizares (Universidad Nacional de Educación a Distancia - UNED), Prof. Ana Garcia-Serrano (Universidad Nacional de Educación a Distancia - UNED), Mr. Francisco Javier Sanchez Botas (INTECCA (UNED))</i>	
<b>Creating a sense of belonging for refugees through entrepreneurial learning and mentorship</b>	<b>112</b>
<i>Ms. Patricia Huion (UCLL), Mr. Ahmet Sayer (UCLL)</i>	

<b>Decentralising online education using blockchain technology</b>	<b>123</b>
<i>Dr. Alexander Mikroyannidis (The Open University), Dr. Allan Third (The Open University), Prof. John Domingue (The Open University)</i>	
<b>Effective learning from captioned video lecture in a foreign language</b>	<b>131</b>
<i>Mrs. Maria Pannatier (Geneva University), Prof. Mireille Betrancourt (Geneva University)</i>	
<b>Enhancing ICT Personalized Education through a Learning and Intelligent System</b>	<b>142</b>
<i>Dr. Abdulkadir Karadeniz (Universitat Oberta de Catalunya (UOC)), Dr. David Bañeres (Universitat Oberta de Catalunya (UOC)), Dr. M. Elena Rodríguez (Universitat Oberta de Catalunya (UOC)), Dr. Ana-Elena Guerrero-Roldán (Universitat Oberta de Catalunya (UOC))</i>	
<b>EXAMINING THE EFFECTS OF LMS ON ACADEMIC PERFORMANCE USING LEARNING ANALYTICS</b>	<b>148</b>
<i>Mr. Abdullah Saykili (ANADOLU UNİVERSİTY), Ms. Aylin Ozturk (ANADOLU UNİVERSİTY), Dr. Evrim Genc Kumtepe (ANADOLU UNİVERSİTY), Dr. Alper Tolga Kumtepe (ANADOLU UNİVERSİTY), Mr. Zafer Can Ugurhan (ANADOLU UNİVERSİTY)</i>	
<b>EXPLORING THE LEARNING BEHAVIOUR PATTERNS OF OPEN AND DISTANCE STUDENTS</b>	<b>156</b>
<i>Ms. Aylin Ozturk (ANADOLU UNİVERSİTY), Dr. Alper Tolga Kumtepe (ANADOLU UNİVERSİTY)</i>	
<b>Exploring the use of Facebook in the classroom: the case of a workshop on the History of Cinema in Mozambique</b>	<b>167</b>
<i>Ms. Diana Manhiça (Universidade Aberta), Prof. Jose Bidarra (Universidade Aberta)</i>	
<b>Fostering a sense of community: the role of interactive web broadcasts to develop online learning communities in STEM</b>	<b>181</b>
<i>Ms. Venetia Brown (The Open University), Dr. Trevor Collins (The Open University), Prof. Nicholas Braithwaite (The Open University)</i>	
<b>From the Net Generation, to the Netflix Generation: : the E-Movie learning concept</b>	<b>182</b>
<i>Dr. Marika Taishoff (International University of Monaco), Dr. Patrice SARGENTI (International University of Monaco)</i>	
<b>Gamification Didactics in Massive Learning Designs</b>	<b>197</b>
<i>Mr. Tiberio Feliz-Murias (UNED), Mr. David Recio Moreno (UNED)</i>	
<b>How to design a quality master's offer? The importance of knowing the students' motivation</b>	<b>209</b>
<i>Dr. Miryam de la Concepción (Universidad Nacional de Educacion a Distancia (UNED)), Dr. Violante Martínez Quintana (Universidad Nacional de Educacion a Distancia (UNED))</i>	
<b>Human-Computer Learning Interaction in a Virtual Laboratory</b>	<b>224</b>
<i>Mr. Vasilis Zafeiropoulos (Hellenic Open University), Prof. Dimitris Kalles (Hellenic Open University)</i>	
<b>Immersive Telepresence: A framework for training and rehearsal in a post-digital age.</b>	<b>237</b>
<i>Dr. Tom Gorman (Coventry University), Dr. Tiina Syrjä (University of Tampere), Dr. Mikko Kanninen (Tampere University), Mr. Matias Palo (University of Tampere)</i>	
<b>Inclusiveness and accessibility: adaptations and services</b>	<b>253</b>
<i>Mr. Tiberio Feliz-Murias (UNED), Mrs. Alejandra Pereira Calvo (Universidad Nacional de Educacion a Distancia (UNED)), Mrs. Ana Andreu (Universidad Nacional de Educacion a Distancia (UNED)), Ms. Inmaculada Simón Fernández (Universidad Nacional de Educacion a Distancia (UNED)), Ms. Sevillano Asensio Esther (Universidad Nacional de Educacion a Distancia (UNED))</i>	

<b>Learning analytics of the first Finnish learning analytics cMOOC</b>	<b>259</b>
<i>Dr. Sami Suhonen (Tampere University of Applied Sciences), Mr. Seppo Nevalainen (Karelia University of Applied Sciences), Ms. Riikka Muurimäki (Seinäjoki University of Applied Sciences), Mr. Jukka Kurttila (Oulu University of Applied Sciences)</i>	
<b>Learning Analytics, Ethics and Participant Privacy</b>	<b>270</b>
<i>Dr. Brid Lane (IBAT College Dublin), Dr. Eamon Costello (Dublin City University)</i>	
<b>MAPPING THE LEARNER PROFILES IN OPEN AND DISTANCE LEARNING</b>	<b>275</b>
<i>Ms. Aylin Ozturk (ANADOLU UNİVERSİTY), Dr. Alper Tolga Kumtepe (ANADOLU UNİVERSİTY), Dr. Sinan Aydın (ANADOLU UNİVERSİTY)</i>	
<b>On Systemic Change in University Education</b>	<b>284</b>
<i>Dr. Alfonso Herrero de Egaña (Universidad Nacional de Educación a Distancia - UNED), Dr. Carmen Soria (Formación Continua UNED Colaborador Externo), Dr. Alberto Muñoz (Universidad Nacional de Educación a Distancia - UNED)</i>	
<b>Postgraduate studies in a distance university. Profile of the master students in UNED (Spanish National University for Distance Learning)</b>	<b>290</b>
<i>Dr. Gema Juberías (Universidad Nacional de Educación a Distancia (UNED)), Dr. Pablo de Diego Angeles (Universidad Nacional de Educacion a Distance (UNED))</i>	
<b>Short Learning Programmes (SLP) for Professional Development: results from an international collaborative experience (UAb – UNESP)</b>	<b>299</b>
<i>Prof. Gloria Bastos (Universidade Aberta), Prof. Ana Novo (Universidade Aberta), Prof. Helen Casarin (UNESP)</i>	
<b>Students' feelings in social and collaborative learning: some case studies</b>	<b>309</b>
<i>Mr. Jake Hilliard (The Open University), Dr. Jon Rosewell (The Open University), Dr. Karen Kear (The Open University), Dr. Helen Donelan (The Open University), Dr. Caroline Heaney (The Open University)</i>	
<b>Teaching English pronunciation in a MOOC: a complement to official regulated subjects</b>	<b>324</b>
<i>Dr. Eva Estebas-Vilaplana (Universidad Nacional de Educacion a Distance (UNED)), Dr. Mariangel Solans (Universidad Nacional de Educacion a Distance (UNED))</i>	
<b>The Digitalisation of Study Process from Perspective of Academics</b>	<b>336</b>
<i>Mr. Raimonds Strods (University of Latvia), Prof. Linda Daniela (University of Latvia), Prof. Zanda Rubene (University of Latvia)</i>	
<b>The "Multiplier Effect" Student E-Tutors Have on Course Instructors to Incorporate Technology in Classrooms</b>	<b>346</b>
<i>Dr. Simone Adams (University of Graz), Ms. Nadine Linschinger (University of Graz)</i>	
<b>Towards a short learning program on online learning at the Open University of the Netherlands</b>	<b>360</b>
<i>Mr. Iwan Wopereis (Open Universiteit), Mr. Kees Pannekeet (Open Universiteit), Mr. Tom Melai (Open Universiteit), Dr. Kathleen Schlusmans (Open Universiteit), Mrs. Rieny Van den Munckhof (Open Universiteit), Dr. George Moerkerke (Open Universiteit)</i>	
<b>Towards a taxonomy of digital skills and competencies of university teachers – a guide for institutional accreditation practices</b>	<b>367</b>
<i>Dr. Marianne Helfenberger (Distant University)</i>	
<b>Tutors' perceptions of blended and online higher education: The case of Hellenic Open University</b>	<b>379</b>
<i>Mrs. Rozalia Kalantzi (Hellenic Open University), Prof. Theofanis Orphanoudakis (Hellenic Open University)</i>	

---

<b>VetTrip, a playful methodology for training in university environment</b>	<b>389</b>
<i>Prof. Arián Yahyae (Universidad Nacional de Educación a Distancia - UNED), Dr. María del Mar Espinosa (Universidad Nacional de Educación a Distancia - UNED), Dr. Roberto Prádanos (Universidad de Valladolid), Dr. Manuel Domínguez (Universidad Nacional de Educación a Distancia - UNED)</i>	
<b>Virtual classroom use in short learning courses: An exploratory study</b>	<b>403</b>
<i>Mr. Iwan Wopereis (Open Universiteit), Mr. Kees Pannekeet (Open Universiteit), Mr. Tom Melai (Open Universiteit)</i>	
<b>Visual Tools focused on creativity and collaborative work in a blended learning university</b>	<b>413</b>
<i>Dr. Rodrigo Martín-García (UNED), Dr. Raquel Arguedas (Universidad Nacional de Educación a Distancia - UNED), Dr. Carmen López Martín (UNED)</i>	



## "A little muddled and in need of greater clarity": encouraging formative use of the Academic Writing Toolkit

Irene O'Dowd

Hibernia College, Ireland

[iodowd@hiberniacollege.net](mailto:iodowd@hiberniacollege.net)

### Abstract

The Academic Writing Toolkit is an online resource developed for Hibernia College's blended-learning programmes in initial teacher education, to provide distance-learning students with accessible and timely guidance on improving their academic writing. Available to students and faculty via the Moodle LMS and designed for asynchronous delivery, the Toolkit provides guidance on technical writing skills such as referencing, grammar, formatting and style, as well as on specialised areas as reflective writing, assessment writing and dissertation writing. The design was informed by a chunked or bite-size ethos to encourage continuous, formative and self-motivated use throughout the academic programmes. However, an examination of user engagement patterns in the first year suggested that, contrary to expectations, there was little evidence of students returning to the Toolkit for help on key topics at crucial points in their programmes. This paper will outline how elements of the Toolkit were updated in response to findings from previous research (presented at OOFHEC2018). Findings from a study of engagement with the updated version of the Toolkit (n=334) will be presented, including comparisons of findings from learning analytics data collected from activity logs for pre- and post-redesign iterations. The results of this analysis, combined with survey feedback on students' use experience (n=41), will inform an evaluation of the impact of specific design and dissemination enhancements on Toolkit engagement. In particular, the impact of increased awareness of the Toolkit's potential among College faculty will be discussed. These findings will give practical insights into the roles of instructional design and faculty awareness in creating digital learning tools that meet the unique engagement and support needs of distance learners.

**Keywords:** academic writing, online, toolkit, initial teacher education, blended learning, distance learning, support, learning analytics, engagement, faculty

### 1. Introduction

In 2017 Hibernia College, which provides masters programmes in initial teacher education via an online-blended model, developed a new online resource – the Academic Writing Toolkit – for distance-learning students to improve their academic writing skills. It has been demonstrated that online and particularly blended-learning approaches enhance the quality of learning experiences and outcomes as compared to face-to-face learning, particularly blended learning that involved more learning time, additional instructional resources and interactive course elements (Means, Toyama, Murphy and Baki, 2013). With specific regard to writing skills, Singleton-Jackson and Colella (2012) justify the appropriateness of using technology for teaching literacy skills: "writing in all forms is, for the most part, currently performed with technological devices" (p.26). They also claim that online writing resources can provide a useful link between technology use and writing practices. Nallaya and Kehrwal (2013) suggest that online resources, including step-by-step directions and examples, support the development of academic literacies and offer both accessibility and the option to revisit content as needed. Similarly, Tuomainen (2016) highlights "convenience, flexibility and greater allowances for individual time management" as benefits of online writing resources. However,

research shows that such resources work best in the context of a wider support structure. A systematic review of research in blended-learning academic writing supports by Scott, Ribeiro, Burns *et al.* (2017) highlights the importance of careful consideration of the technologies used for delivering writing instruction online as well as the inclusion of face-to-face interactions to provide feedback and reassurance to students. In line with best practice, therefore, the Toolkit was designed not just as a useful resource aligned with well-established principles of online pedagogy, but also a component of the College's overall strategy for academic writing support alongside online module content, webinars, onsite events, orientation and tutor feedback and support. Designed for asynchronous delivery, the Toolkit comprises a collection of topic-specific units, each composed of a number of digital resources providing guidance on areas such as referencing, grammar, formatting and style, reflective writing and assessment writing. In recognition of students' need to plan their time, the design ethos favoured conciseness and practicality, with each activity given an estimated time-on-task duration for a maximum of 20 minutes' completion time per unit (see Figure 1). The Toolkit was developed in the College's Moodle LMS and released to students and faculty in 2017.

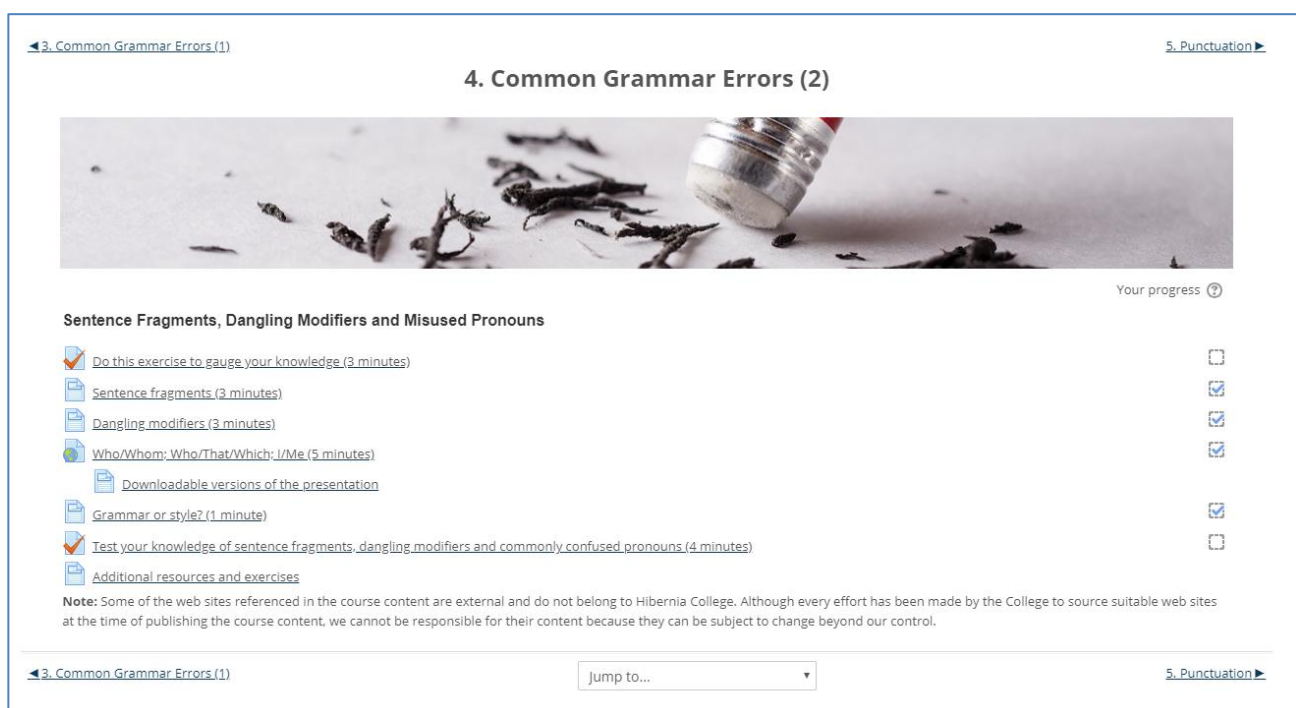


Figure 1: Example of a topic-specific unit in the Academic Writing Toolkit

### 1.1 Investigating engagement with the Toolkit

Some months after the release of the Toolkit's first iteration, an initial study of LMS data traces (O'Dowd, 2018) was conducted in order to investigate whether students were engaging with the resource in a formative way – that is, as a resource to be drawn on repeatedly for assistance on specific writing problems throughout their studies. Data traces studied included proxies of engagement such as numbers of logins, file downloads, activities visited, videos viewed, and quizzes attempted and/or completed. The study found very little interaction with the Toolkit after the first two weeks, a period during which the Toolkit was scheduled as a compulsory element for full completion during the students' orientation programme (O'Dowd, p. 136). As such, the peak in Toolkit use during orientation was unsurprising; however, the extremely low level of activity in the subsequent period was a cause for concern. Although students' responses in a voluntary survey in the same study were positive about the Toolkit, many respondents felt that there was too much content to cover in just two weeks, especially at a time when they were also trying to absorb a lot of other

new information at the start of their programmes. It was concluded that scheduling the completion of the Toolkit in this manner made it less likely that it would be used formatively. The hypothesised superior efficacy of formative, sustained use of the resource, as opposed to completing it once and not returning to it, is supported by Chanok, D’Cruz and Bisset (2009), which confirms that on-demand academic writing resources that can be accessed over time may be more valuable to students than similar instruction scheduled early on in their studies. The Toolkit study suggested that a new approach towards promoting engagement – whereby faculty and student-facing staff would take a proactive role in guiding students towards the Toolkit at key points – might create a more sustained level of engagement than was achieved by including it as a compulsory element of orientation. As a content review of the Toolkit was scheduled for early 2019, it was decided to combine this with a review of the positioning and scheduling of the Toolkit. The model for the Toolkit update thus combined input from digital design, faculty and students (Figure 2).

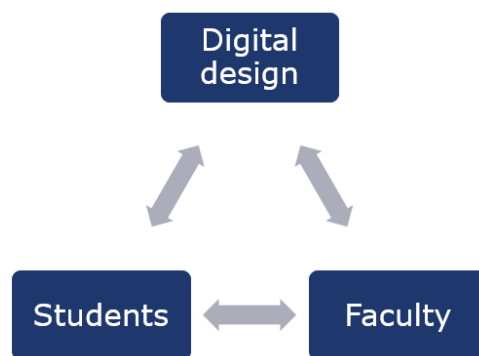


Figure 2: The Toolkit update model

Two key areas for action emerged from these reviews: faculty engagement and calendar notifications. Enhancements to these areas, along with the theoretical approaches that informed them, are discussed in the following sections.

### 1.2 Faculty engagement

Communications within the College suggested that there was a very low level of awareness of the Toolkit’s existence among College staff and faculty. This meant, of course, that lecturers and tutors were not directing students towards it as a resource, nor were they using it themselves. Most of the College’s tutors and supervisors are adjunct faculty who work remotely (the College does not have a campus), making the informal dissemination of information about new LMS tools more challenging than it would be on a physical campus. Unfortunately, it also emerged that faculty members who were aware of the Toolkit could not easily find it in the LMS, sometimes due to access restrictions based on their assigned roles. This lack of alignment between online learning design and the practices and needs of academic faculty was a key failing in the initial Toolkit rollout. It indicated a disconnect in the process of integrating the online content-based domain with the tutor-based structures of teaching and learning – an instance of blended learning not being sufficiently “blended”. It is instructive to frame this effect in relation to the phenomenon that Biesta (2015) terms *learnification*. In Biesta’s summation, “the point of education is that students learn something, that they learn it for a reason, and that they learn it from someone” (p. 76). Learnification occurs when the “by someone” part of the equation is unaccounted for in the provision of content directly to the learner. In blended-learning scenarios where discrete processes exist for the delivery of on-demand content and the pedagogical practice of tutors, learnification or even *designification* is an ever-present hazard. Feedback from the 2017 Toolkit study survey suggested that there had been too little emphasis on the role of faculty –

tutors, module leads and supervisors – in the positioning of the Toolkit, leading some students to believe, erroneously, that the Toolkit was the only academic writing support available to them (O’Dowd, p. 136). Conversely, without the experience of engaging with the Toolkit themselves, tutors and supervisors missed out on their students’ perspective of engaging with the resource as online learners (Gallagher and Maxfield, 2018) and, crucially, on how the Toolkit might be able to help the tutors themselves to support students’ academic writing. It became apparent that improved communication with faculty was needed if the Toolkit was to be accepted and integrated into academic writing instruction.

In early 2019, Toolkit developers and senior academic staff arranged to present the Toolkit at adjunct faculty orientation and training sessions in time for the new programme intake, to make faculty aware of the Toolkit’s existence and show them where to find it on the LMS. Faculty and research supervisors had the opportunity to share thoughts on what they found useful and what would help them to leverage the Toolkit for their teaching. Some suggestions, such as a printed PDF page of links to each unit, highlighted the fact that each teacher or academic will have different accessibility requirements and preferences and that sometimes the simplest, least technology-driven solutions are what users want. The presence of a faculty champion at these events – that is, a tutor who was already using the Toolkit for teaching and who found it helpful – enabled critical discussion of the resource and facilitated reception of its potential as a support for teacher-led writing instruction. For example, there was discussion about the possibility of a flipped-learning model where students explored the Toolkit and then used live webinar time to discuss points on which they needed clarification.

### 1.3 Calendar notifications

The academic calendar in the Moodle LMS is a crucial resource for students to plan their academic schedule effectively. It provides alerts for module content releases, module assessment releases and submission deadlines, and other elements of their programmes such as webinars, on-site workshops and school placements. Calendar notifications are administered by student-facing support staff in the College. For the 2019 Toolkit update, it was decided to remove the Toolkit from student orientation and, instead, set up calendar notifications at key points of the programmes to remind students to visit particular context-sensitive units of the Toolkit. Figure 3 shows an example of such a notification as it appears to students when they click on the item in their calendar.

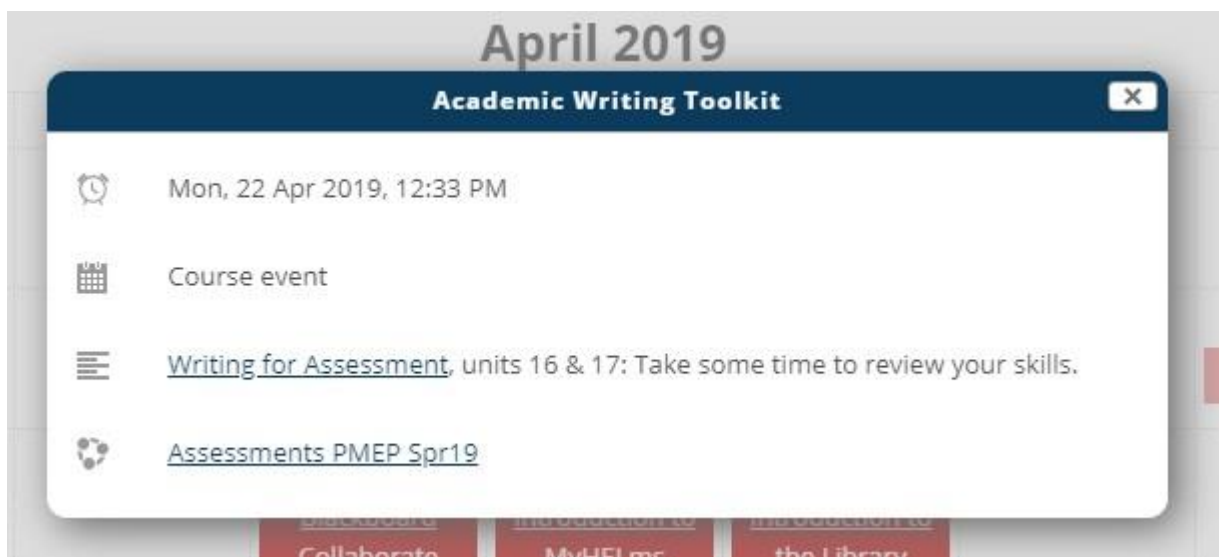


Figure 3: A calendar notification reminding students to visit the Toolkit



Setting up these notifications involved close collaboration with student support, academic and technical support teams to ensure that notifications were scheduled and released correctly, were relevant, would cause no additional anxiety for students, and would provide an optional reminder or *nudge* instead of a mandated requirement. This idea borrows from *nudge theory* (Thaler and Sunstein, 2008), which has its origins in behavioural economics but is being increasingly researched and applied in education (Damgaard and Nielsen, 2018). The concept of nudging, which is grounded in principles of cognitive behaviourism, focuses on guiding users of a resource or system towards making beneficial behaviours or choices by themselves. Applied to education, a nudge system aims to overcome cognitive-behavioural barriers to effective learning – from individual mindsets to social factors – not by coercion or compulsion but by designing learning environments that foster effective learning behaviours. This is achieved through what Thaler and Sunstein term “choice architecture” (p. 2), an example of which could be a simple automated e-mail reminder to submit an assignment or visit a discussion forum – or a calendar reminder to visit an online resource for help, as in this case. In order to ensure that the LMS calendar notifications were positioned effectively, academic input was sought on the most commonly encountered academic-writing issues. An e-mail survey was conducted with module leads, tutors and supervisors, the results of which are summarised in Table 1. Based on this information, calendar notifications reminded students to look at Toolkit units on referencing, writing for assessment, and grammar and usage upon release of module assessments. Further reminders were released two weeks before assessment submission, reminding students of the units on referencing, academic impropriety, and use of the text-matching software.

Table 1: Summary of tutor and supervisor feedback on common academic writing problems

Theme	Specific problems	Sample comment
Argument	<ul style="list-style-type: none"> <li>• Narrative approach: little evidence of synthesis or critical reflection</li> <li>• Unsubstantiated claims; opinion as fact</li> <li>• Excessive didacticism or preachiness</li> </ul>	“outlining the product of their research in a narrative manner without, at times, an effective engagement with this material”
Reading	<ul style="list-style-type: none"> <li>• Narrow range of reading and resources</li> <li>• Citing webinars or course content instead of published peer-reviewed sources</li> </ul>	“an overdependence on a narrow range of resources and work that does not always indicate evidence of wider reading”
Writing	<ul style="list-style-type: none"> <li>• Lack of clarity in writing</li> <li>• Lack of cohesion and sequence</li> <li>• Absence of revision</li> <li>• Repetitive style; poor grasp of fluent academic language and expression</li> <li>• Carelessness: syntax, spelling, punctuation, grammar errors etc.</li> <li>• Referencing and citation errors; inexact or vague citation practice</li> <li>• Verbosity; lengthy sentences, often comma spliced</li> <li>• Overuse of quotations, indicating poor understanding of literature</li> </ul>	“writing that may be, in places, a little muddled and in need of greater clarity”

In addition to the transformations mentioned, a complete review of the Toolkit content was conducted and several activities were updated. Additions to the 2019 iteration of the Toolkit that were not present in the 2017 version included two units on dissertation writing, a unit on academic impropriety, and a unit on the use of Urkund, a text-matching application that students are required to run on their assessment content before submission. A new Challenge quiz was added at the end of the Toolkit to allow students to test themselves and, if successful, earn a digital badge. In response to faculty feedback, several improvements were made to navigation links so that the Toolkit would be easier for faculty members to find in the areas of the LMS that they were most familiar with. This updated version of the Toolkit was released to a new cohort of students in April 2019.

#### **1.4 Research questions**

Having updated the Toolkit's content, reworked its scheduling, enhanced faculty engagement with the resource and released it to students, the question remained: would these redesign features have any impact on levels of student engagement? Thus, the purpose of this study was to explore how the updated Toolkit was used and experienced by students during the first five months of their programme, from April through August 2019. Specifically, the study aimed to answer the following research questions:

- i. Does activity in the first five months indicate that students might return to the Toolkit over time?
- ii. Is there a difference in levels of engagement compared to the 2017 study?
- iii. What did students think of the Toolkit?

#### **2. Study design and methods**

The population for this study comprised all students enrolled in the two ITE programmes that began in the College in April 2019 (n=334). The data came from two sources: activity logs from the Moodle LMS and responses to an anonymised, voluntary post-module online survey (n=41). The LMS data was first analysed to draw some inferences from students' online interaction with the Toolkit resources over the first five months, particularly with a view to ascertaining if there is evidence of repeated, formative engagement. A systematic review of learning analytics research methods by Avella, Kebritchi, Nunn *et al.* (2016) found that analysis of "big data" can help educators to understand and improve the student learning experience. On the other hand, this application of learning analytics, although useful in some study designs, has limitations that must be considered. Lockyer, Heathcote and Dawson (2013) apply the term *checkpoint analytics* to "the snapshot data that indicate a student has met the prerequisites for learning by accessing the relevant resources of the learning design", pointing out that this type of analytics does not provide insight into learning processes such as synthesis or sense-making. Nonetheless, some insights can be obtained through the analysis of online use patterns, and these can be a valuable source of knowledge when triangulated with other data. To this end, a post-module online survey was included in the study design in order to capture information on students' subjective experiences of using the Toolkit. The responses were analysed to identify salient patterns and themes and thus provide additional insights into the learning analytics data. Another source of data was provided via the 2017 Toolkit study, which offered a comparator against which to analyse and interpret the data from the present study, particularly with regard to the second research question. Although the compared studies involved separate cohorts in different years, the validity of the comparative analysis is supported by the cohorts' similarities in size and demographics, their enrolment in the same programmes and the same online resource, and that the data collection took place over a comparable time period.

## 2.1 Ethics

Ethical approval for this research was obtained from the College's Research Ethics Committee, and the research was conducted within the parameters of the College's research ethics guidelines, which align with those of the British Educational Research Association (BERA, 2018). With regard to participant consent, all students enrolling on Hibernia College programmes sign a Data Protection Statement as part of their registration. As the purpose of this research was to improve the design of online content, it is covered by the College's specification of "aggregate or anonymised information gathered [and] used/published to feed back into internal academic research [...] and overall programme enhancements including programme design, content, delivery and validation" (Hibernia College, 2018). Participant consent was thus obtained for the use of secondary data through the students' signing of the form. Moodle LMS is a fully secured online learning environment that adheres to international data protection standards. All study data was fully anonymised and will be stored on a password-protected securely stored external drive in compliance with ethical and legal data-protection requirements. Students taking the survey were informed of the purpose of the data collection and were assured that the survey was completely anonymous and participation was voluntary.

## 3. Analysis

- i. Does Toolkit activity in the first five months indicate that students might return to the Toolkit over time?

Figure 4 graphs the number of use events in the Toolkit unit as captured in the LMS logs between April and August 2019. The graph shows that there is a sustained level of activity in the Toolkit from the beginning of April until the end of June, with the number of use events staying above zero during that period except for two individual data points in April and May. There is a disproportionately high peak in Toolkit activity in mid-April, which may be explained wholly or partially by the release of an Academic Writing Quiz in the LMS during the students' orientation programme. Figure 4 also indicates, with the use of coloured dots, where module assessment release and submission dates occurred during the studied period. Most, although not all, activity peaks occur when assessments are released; these also coincide with the appearance of reminder notifications in the calendar. Unsurprisingly, a trough in activity occurs during the programmes' summer holidays, accompanied by an overall tapering of activity for the months of July and August.

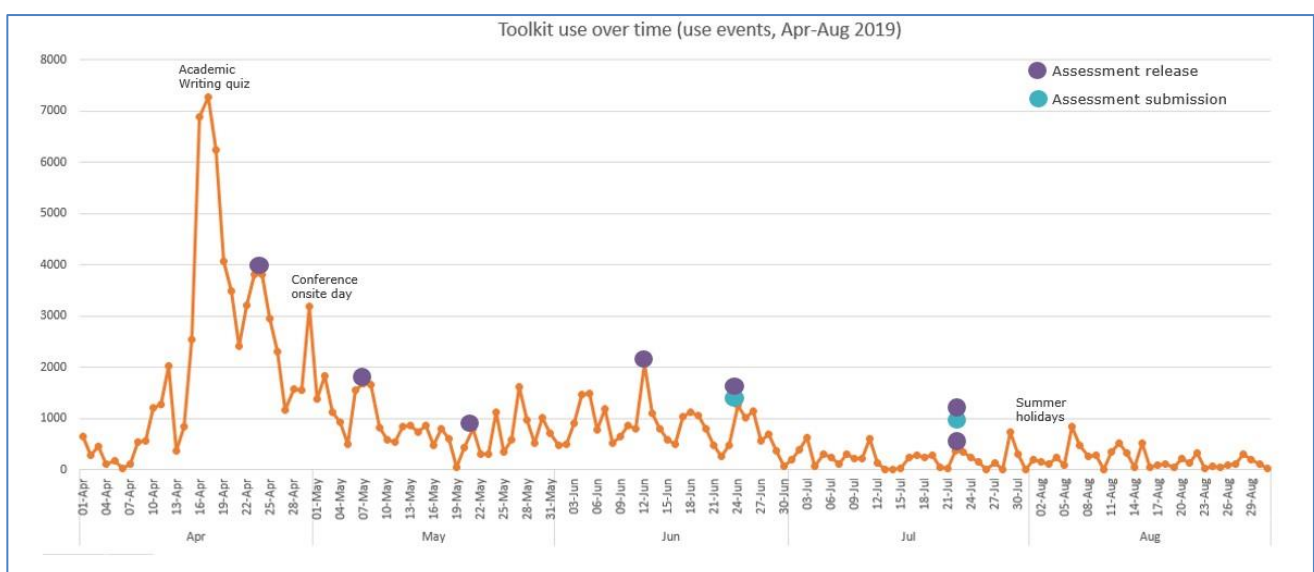


Figure 4: Toolkit use events from April through August 2019

ii. *Is there a difference in levels of engagement compared to the 2017 study?*

Figure 5 compares Toolkit activity by the 2017 cohort (blue) with activity for a similar period by the 2019 cohort (orange).

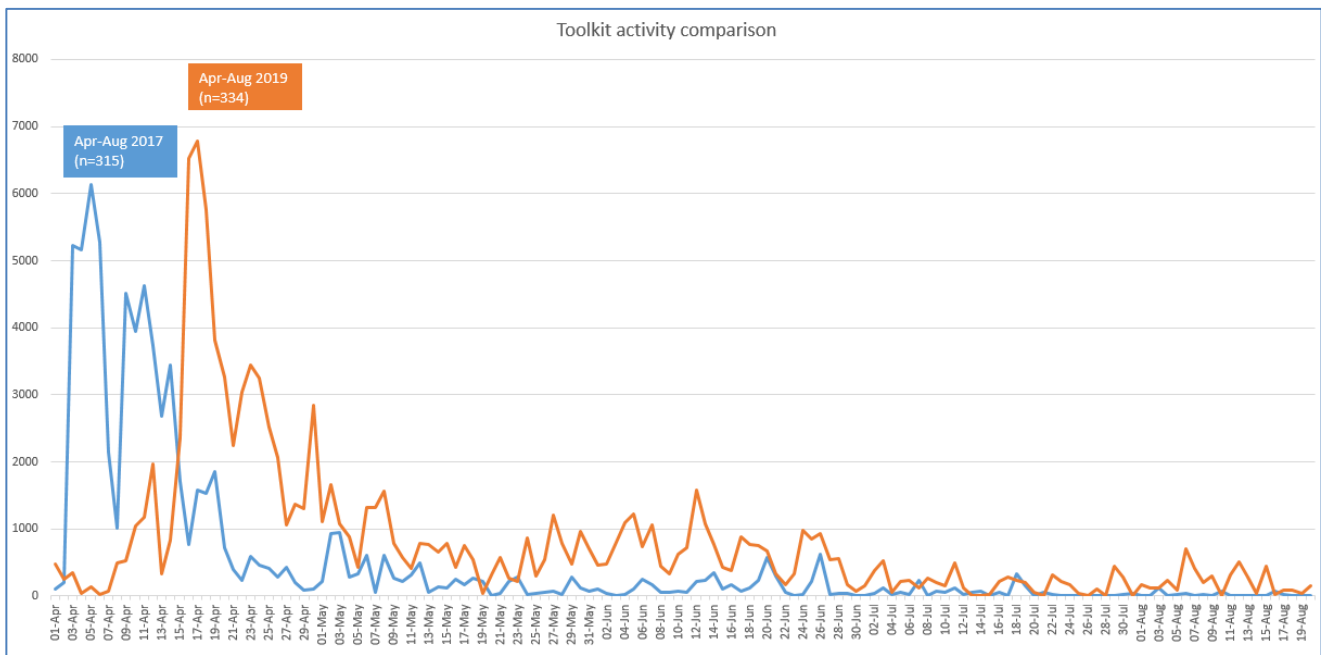


Figure 5: Toolkit activity comparison, April through August (2017 and 2019 cohorts), common units only

To facilitate a valid comparison, the 2019 data in this graph excludes any activity recorded for the new units added in the update, as these units were not available to the 2017 cohort. On an initial examination of the graph, the 2019 data series shows a higher and more sustained pattern of activity throughout the period. The number of use events in 2017 never reached above 1000 following student orientation in April (when completion of the Toolkit was compulsory), whereas this threshold was reached or exceeded several times in 2019 until the end of June. Even in the tailing-off phase during the summer, which was common to both populations, more activity events were evident in 2019 than in the same period in 2017, the latter showing as almost completely flat in August. The histograms in Figure 6 show that the 2017 cohort featured a much higher number of students with low activity levels, whereas there is evidence of more sustained activity over time in 2019.

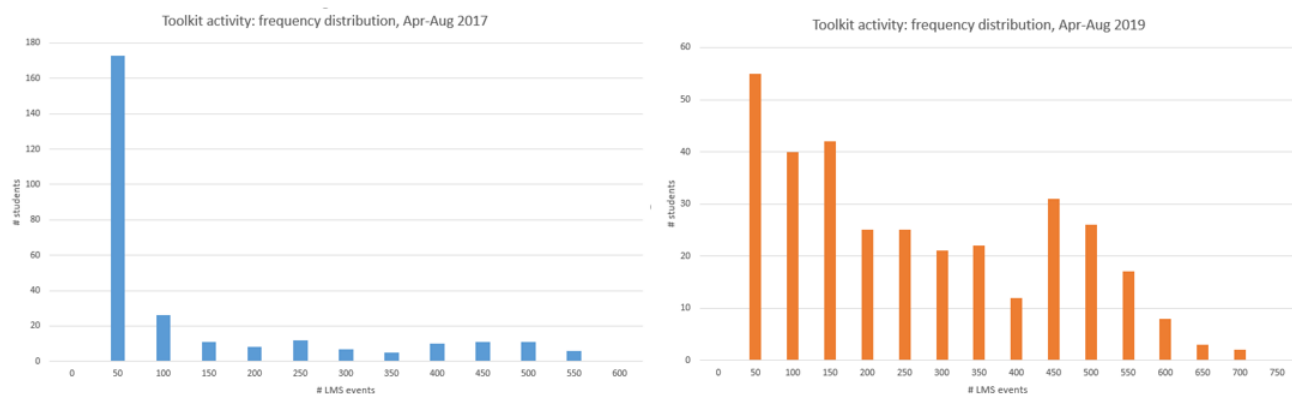


Figure 6: Histograms showing frequency distributions of Toolkit activity data for 2017 and 2019 cohorts

A statistical test was conducted in order to establish whether, and to what extent, the differences in mean activity levels between the two cohorts were statistically significant. Given that the distributions in both populations are skewed positively (see Figure 6), a Mann-Whitney U test was used in preference to a parametric t-test. Table 2 summarises the descriptive statistics for both populations.

Table 2: Descriptive statistics for both populations (median and interquartile range)

	Min.	Max.	Median	Interquartile range
Toolkit activity, 2017 cohort	0	315	18	161
Toolkit activity, 2019 cohort	0	334	209	327.5

The results of the statistical test (Table 3) showed that the mean rank of the 2019 group was higher than that of the 2017 group. This confirms that, overall, the 2019 group had the highest mean number of use events.

Table 3: Statistical test output: mean rank and sum of ranks

	N	Mean rank	Sum of ranks
Number of use events, 2017 cohort	315	224.22	63005.50
Number of use events, 2019 cohort	334	377.78	125799.50

Table 4 shows the results of the test for statistical significance. From this, it can be concluded that Toolkit activity was statistically significantly higher in the 2019 cohort ( $p < 0.001$ , Mann-Whitney U = 23384.50).

Table 4: Mann-Whitney U and statistical significance test output

	Number of use events
Mann-Whitney U	23384.50
Z	-10.692
Asymp. Sig. (2-tailed)	.000

In terms of effect size, the  $r$  value was calculated from Z as 0.4315. This indicates that there is a moderately strong probability that any single value from one cohort will be greater than a value from the other cohort.

*iii. What did students think of the Toolkit?*

There were 41 respondents to the online survey. The bar chart in Figure 7 shows the main themes in the free-text responses on the most useful aspects of the Toolkit. Referencing was cited as being the most useful aspect of the Toolkit, which reflects the 2017 cohort's responses. The new unit on dissertation writing was also mentioned specifically by some students, but no other strong preferences were evident. A higher number of students in 2019 than in 2017 said that they found everything in the Toolkit useful.



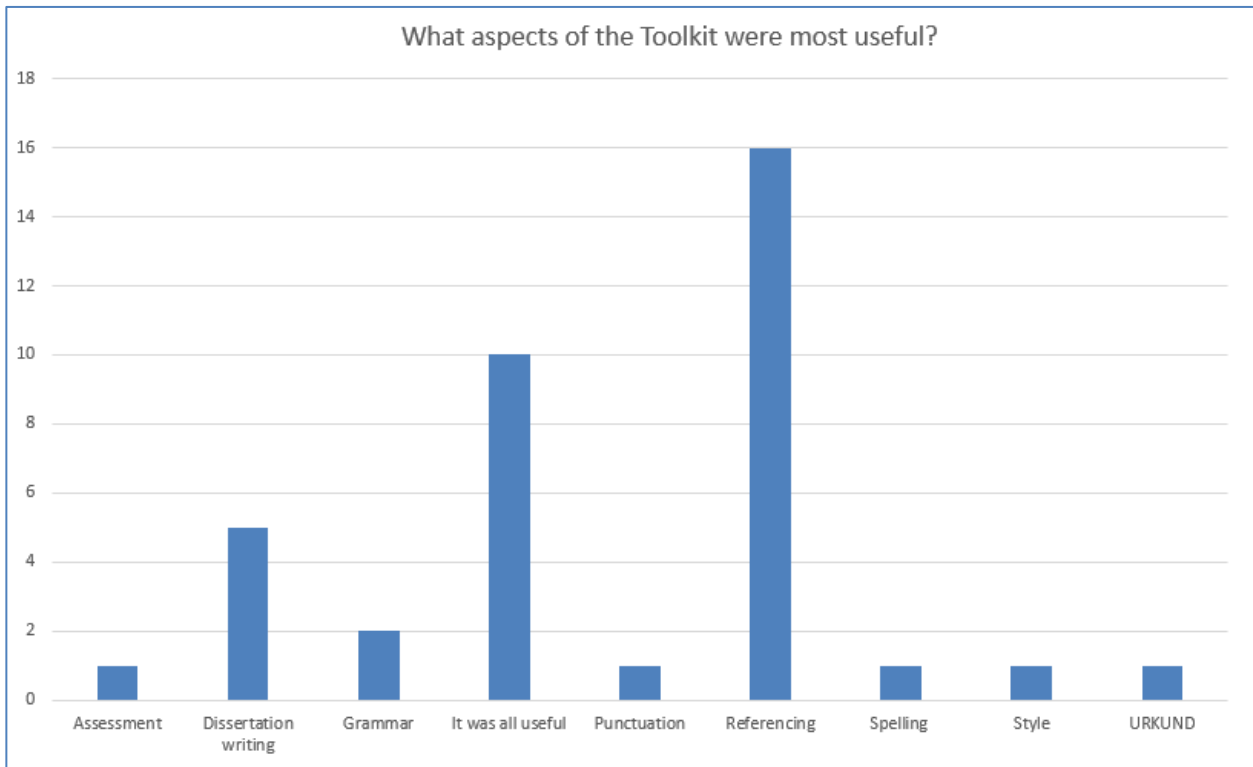


Figure 7: Most useful aspects of the Toolkit as expressed in free-text responses

A similar analysis of free-text responses was conducted on answers to the question "How would you improve the Toolkit?" and the results are graphed in Figure 8.

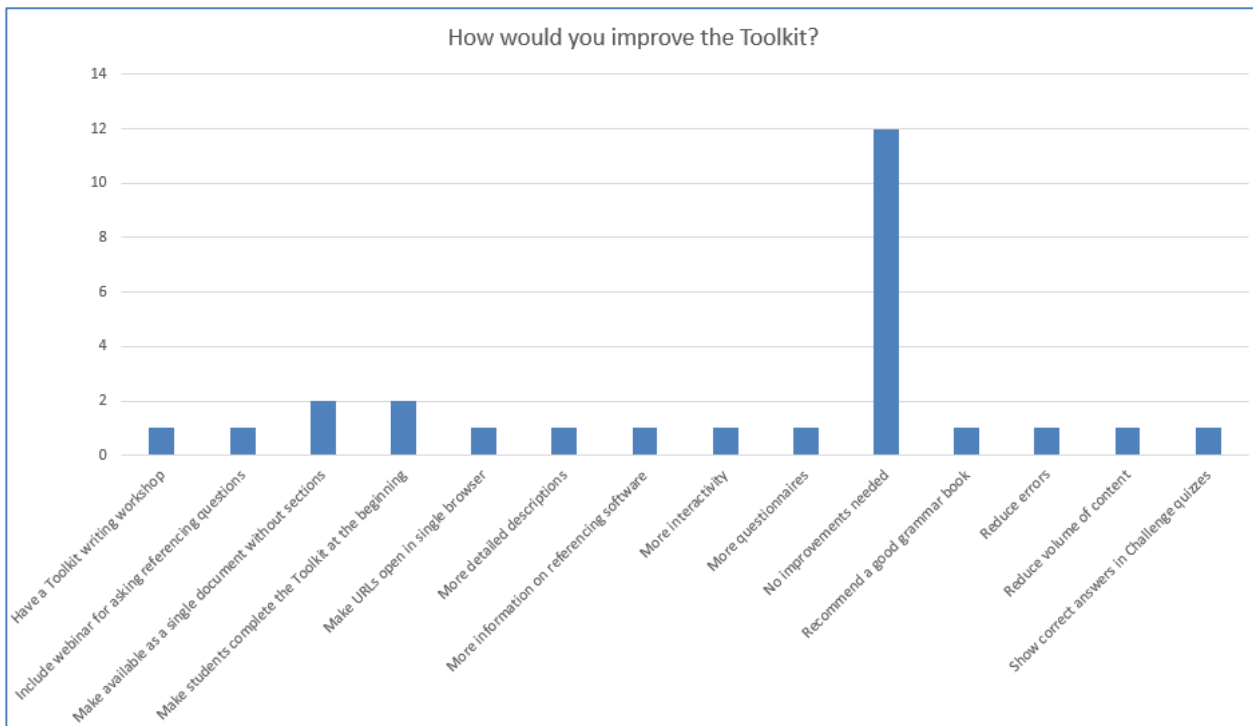


Figure 8: Suggestions for improvement of the Toolkit as expressed in free-text responses

As can be seen, by far the most frequent response was that no improvements were needed. Interestingly, the nudge-based scheduling model did not appear to have been universally liked, with two students expressing a wish that the College "make students complete the Toolkit at the beginning" – the very approach that had proved quite unpopular with students in the 2017 cohort.

The survey results also indicated that 65.9% of respondents intended to revisit the Toolkit throughout their programme (see Figure 9). The response scale ranged from 1 (Not likely at all) to 5 (Extremely likely).

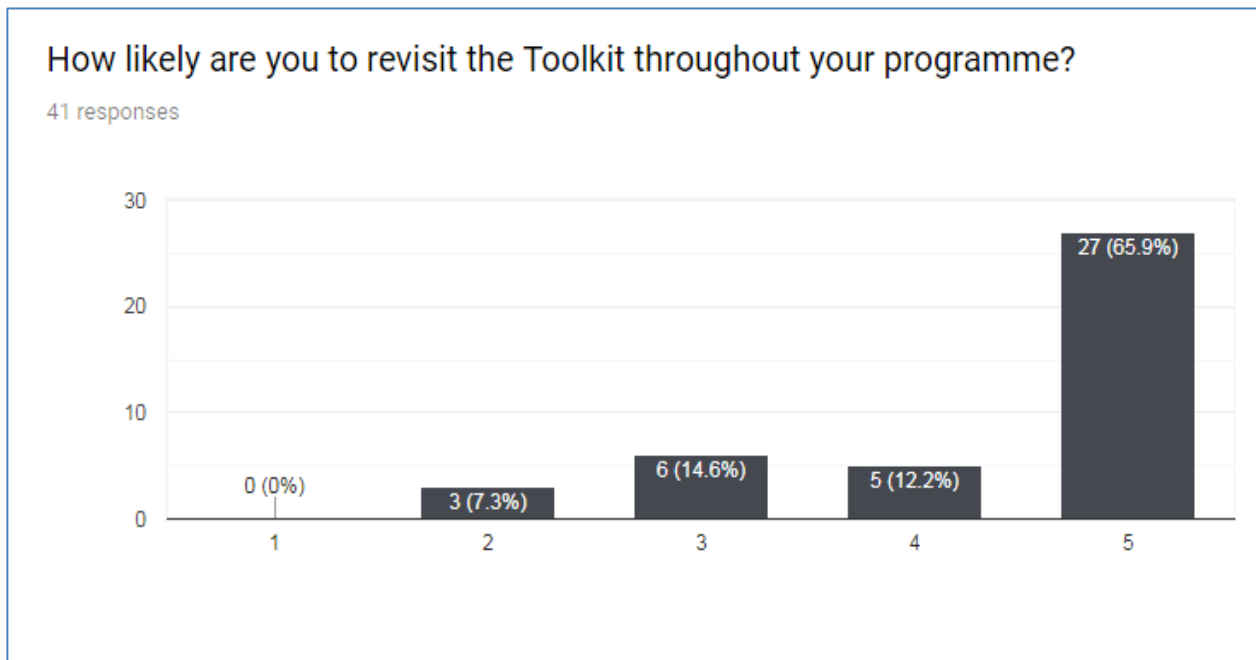


Figure 9: Responses to question regarding likelihood of revisiting the Toolkit

#### 4. Discussion

This study was conducted over a short period at the start of the cohort programmes. Therefore, any inferences drawn from the data analysis should be assessed with this limitation in mind. It is also important, when drawing inferences from learning analytics data, to be cognisant of its limitations and recognise what such data does not capture. The first research question concerned students' revisiting of the Toolkit as a resource over time. Without longitudinal analysis it is not possible to draw a firm conclusion regarding the nature of students' engagement; the study cannot confirm, for example, whether the intention to revisit the Toolkit as expressed in the survey is indicative of students' actual use patterns over time. However, within the parameters of the available data, it is clear that activity levels in the Toolkit for the initial five-month period suggested a reasonable level of sustained engagement up until the summer months, when a reduction in activity is to be expected due to summer holidays. This is supported by the findings of the data analysis and comparison for the second research question, on whether there is a difference in levels of engagement compared to the 2017 study. The comparative analysis of activity data for the two cohorts demonstrates a higher and more sustained level of engagement in the 2019 group than in the 2017 study. It is not possible for this study to conclude with certainty whether, or to what extent, this improvement is due to Toolkit changes such as increased faculty involvement, LMS calendar notifications or the Toolkit's removal from the student orientation programme. However, given the similarity of the two groups and the other conditions of the study, it would appear to be a plausible hypothesis – particularly in light of the confirmed statistical significance of the finding and the strong effect size of the differences between the cohorts.

Further research, possibly including multivariate regression methods to control for other variables, could lend further weight to this hypothesis and enable a more detailed interrogation of the results.

The findings confirm the role of collaborative, iterative learning design in the enhancement of online engagement with learning materials. There is scope for further exploration of these areas with future cohorts. A combination of learning analytics and qualitative data could enable detailed analysis of students' online behaviours in relation to specific content formats in the Toolkit. A potentially interesting avenue of exploration is indicated by the finding was that not everyone who responded to the survey did the Challenge quiz, although they all completed almost every other unit. The LMS logs show that only 50 Challenge completion badges were assigned for the whole cohort, and the completion levels for the Challenge quizzes were lower than in other quizzes in the Toolkit. This could indicate that students conceptualise the quizzes in the Toolkit as formative learning tools rather than a reward-based summative test. This hypothesis is supported, albeit anecdotally, by a suggestion in the survey that detailed feedback should have been provided in the Challenge quiz. To focus more explicitly on academic writing, an area that warrants further research is the complex role of technology in facilitating and shaping students' writing (Coffin and Goodman, 2003; Singleton-Jackson and Colella, 2012). This could feasibly be a focus for future research and would facilitate inquiry into whether resources such as the Toolkit are enhancing writing quality and writing practices among students, or whether other technologies are exerting a stronger influence in these areas.

Data-driven approaches in higher education, including nudging, are becoming more commonplace (Desouza and Smith, 2016). In conducting such research, it is important to consider the ethical justification for implementing such approaches and think critically about the assumptions that often accompany data-driven solutions (Lockyer et al., 2013; Knox, Williamson and Bayne, 2019). Academic staff involved in teaching are quite justifiably sceptical about technology-based tools being promoted as a 'magic bullet' for the problems they encounter. They understand that the teaching of academic writing is not an isolated event but occurs in the broader context of teaching and learning (Scott et al., 2017). As this study demonstrates, teacher input and acceptance are essential for the successful integration of digital resources in blended education; a key factor in achieving these is the building of trust in the tool. Support at senior management and academic levels was crucial for the positioning of the Toolkit; the dissemination of prior peer-reviewed research on the resource played an important role in enhancing its credibility among senior staff and faculty and confirming that it had been designed to pedagogically sound specifications. Having gained experience of the Toolkit and received endorsements of its utility from their peers, faculty members were happy to promote it at student-facing webinars and onsite events. This exemplifies the cyclical, multidirectional nature of the conceptual model adopted for the Toolkit update (Figure 2): designers working with faculty, faculty working with students and, importantly feedback being gathered from faculty and students that will improve the Toolkit design in future iterations. Further qualitative research could explore teachers', students' and designers' experiences of this process and its impact on the teaching and learning of academic writing.

## **5. Conclusion**

Gauging the effectiveness of online pedagogical tools delivered to a dispersed student body is just one among many challenges facing educators working in online and blended learning environments. This study aimed to add to the existing body of knowledge on student online engagement and academic writing support mechanisms in blended-learning and distance education. The study considered three research questions relating to student and faculty engagement with the Academic Writing Toolkit: whether the engagement observed in the first five months indicate that students might return to the Toolkit over time; whether there was a statistically significant increase in students' engagement with the Toolkit following the redesign of its

scheduling and positioning; and what students' experience of using the Toolkit was. Online activity data analysis found that engagement with the Toolkit decreased after the first month, but evidence of sustained activity levels for most of the period suggested that students were revisiting the resource. There was a statistically significant increase in activity levels compared to a similar period in 2017, and this effect was moderately strong. The study drew no conclusions regarding the impact of updates and enhancements on Toolkit engagement and recommended further research to evaluate this. Based on survey responses, students' experience of the Toolkit was positive, with few requests for improvement and a high level of intention to revisit the Toolkit for support throughout their programmes.

## 6. References

- Avella, J.T., Kebritchi, M., Nunn, S.G. & Kanai, T. (2016). Learning Analytics Methods, Benefits, and Challenges in Higher Education: A Systematic Literature Review. *Online Learning*, 20(2), 13-29.
- Biesta, G. (2015) What is Education For? On Good Education, Teacher Judgement, and Educational Professionalism. *European Journal of Education*, 50(1). DOI: 10.1111/ejed.12109
- British Educational Research Association (BERA) (2018). *Ethical Guidelines for Educational Research, fourth edition*. London. Retrieved from <https://www.bera.ac.uk/researchers-resources/publications/ethical-guidelines-for-educational-research-2018>
- Chanock, K., D'Cruz, C., & Bisset D. (2009). Would you like grammar with that? *Journal of Academic Language & Learning*, 3(2), 1-12.
- Coffin, C.J. & Goodman, S. (2003). Academic writing in an electronic environment. In Coffin, C., Curry, M.J., Goodman, S., Hewings, A., Lillis, T. & Swann, J. (eds.), *Teaching Academic Writing: A Toolkit for Higher Education*. London: Routledge, 130-156.
- Damgaard, M.T. & Nielsen, H.S. (2018). Nudging in Education. *Economics of Education Review*, 64, 313-342. DOI: 10.1016/j.econedurev.2018.03.008
- Desouza, K., & Smith, K. (2016). Predictive analytics: nudging, shoving, and smacking behaviors in higher education. *EDUCAUSE review*, 51, 10-20.
- Gallagher, D. & Maxfield, A. (2018). Learning Online to Tutor Online: How We Teach Writing Tutors. *WLN Journal of Writing Centre Scholarship*, Chapter 16 (online). Retrieved from <https://wlnjournal.org/digitaleditedcollection1/GallagherMaxfield.html>
- Hibernia College (2018). *Privacy Policy*. Retrieved from <https://hiberniacollege.com/privacy-policy/>
- Knox, J., Williamson, B. & Bayne, S. (2019). Machine behaviourism: future visions of 'learnification' and 'datafication' across humans and digital technologies. *Learning, Media and Technology*, DOI: 10.1080/17439884.2019.1623251
- Lockyer, L., Heathcote, E. & Dawson, S. (2013). Informing Pedagogical Action: Aligning Learning Analytics with Learning Design. *American Behavioral Scientist*, 57(10), 1439-1459. DOI: 10.1177/0002764213479367

- O'Dowd, I. (2018). Examining engagement with an online toolkit for academic writing in blended-learning initial teacher education programmes. In Ubachs, G. & Joosten-Adriaanse, F. (eds.), *Blended and Online Learning: 'Changing the Educational Landscape' - Overview of papers on Higher Education for the Future as presented during the Online, Open and Flexible Higher Education Conference in Aarhus, October 2018* (pp. 128-138). Maastricht, The Netherlands: EADTU.
- Means, B., Toyama, Y., Murphy, R. & Baki, M. (2013). The Effectiveness of Online and Blended Learning: A Meta-Analysis. *Teachers College Record*, 115(3), 1-47.
- Nallaya, S., & Kehrwald, J. (2013). Supporting academic literacies in an online environment. *Journal of Academic Language & Learning*, 7(2), A79-A94.
- Scott, D., Ribeiro, J., Burns, A., Danyluk, P., & Bodnaresko, S. (2017). *A review of the literature on academic writing supports and instructional design approaches within blended and online learning environments*. Calgary: University of Calgary. Retrieved from <http://hdl.handle.net/1880/51960>
- Scott, P. & Mouza, C. (2009). The Impact of Professional Development on Teacher Learning, Practice and Leadership Skills: A Study on the Integration of Technology in the Teaching of Writing. *Journal of Educational Computing Research*, 37(3), 229-266.
- Singleton-Jackson, J.A. & Colella, J.A. (2012). An Online Odyssey: A Case Study of Creating and Delivering an Online Writing Course for Undergraduate Students. *MERLOT Journal of Online Learning and Teaching*, 8(1), 24-33.
- Thaler R.H. & Sunstein, C.R. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness*. New Haven: Yale University Press.
- Tuomainen, S. (2016). A blended learning approach to academic writing and presentation skills. *International Journal on Language, Literature and Culture in Education*, 3(2), 33-55. DOI:10.1515/llce-2016-0009

## Analytics for tracking student engagement

### Christine Gardner

Open University, UK  
c.f.gardner@open.ac.uk

### Helen Jefferis

Open University, UK  
h.jefferis@open.ac.uk

### Allan Jones

Open University, UK  
allan.jones@open.ac.uk

### Abstract

Although there has been much research in the area of data analytics in recent years (e.g. Shum and Ferguson 2012), there are questions regarding which analytic methodologies can be most effective in informing higher education teaching and learning practices (Gibson and de Freitas, 2016).

This project focuses on one module within the School of Computing and Communications in the STEM faculty to gain a clearer understanding on why students might, or might not, engage with computer aided learning and teaching (TEL) resources. We explore the use of specific TEL resources on the module 'Communications Technology', a print-based module with a range of online resources designed to supplement the text.

The research questions cover two key areas; the effectiveness of the analytics tools and students' perception of the TEL resources.

Via data analytics we can review:

- When the students engage with the TEL resources and whether this is at predicted times during the module.
- Whether students revisit the TEL resources.

Via individual student feedback we can explore:

- What motivates students to engage with TEL resources.
- Whether students understand topic more deeply as a result of using TEL resources.
- If students are deterred if the resources are too complicated/time consuming.

The findings should be of interest to module teams across many universities. This project will build on previous work undertaken in this area, e.g. Herodotou et al (2017) and Tempelaar et al (2017), and contribute to the wider body of knowledge in the area of data analytics.

**Keywords:** data analytics, informatics



## 1. Introduction

The Open University (OU) has evolved significantly since its creation fifty years ago and has developed its own style of distance learning, 'supported open learning', offering students opportunities to study flexibly, whether at home, work, library or other study centre. Before the advent of the Internet, students relied solely on printed study materials. Key to its continuing success is the utilisation of new technologies.

This study looks at the use of learning analytics to uncover student engagement with computer aided learning and teaching (TEL) resources in the UK Open University module TM355 Communications Technology. This module is an elective component in the University's honours degree in Computing and IT. The module covers such topics as radio propagation, digital signal modulation, source coding, error control, optical fibres, DSL broadband and mobile communications. Parts of the module are supported by sophisticated TEL resources, particularly in relation to coding and error control.

The module is studied towards the end of the students' degree level studies and introduces several complex topics. To aid study of such material, additional experiential learning (Kolb, 1984) is available via online interactive activities, designed to supplement the written materials. These are referred to within the printed materials and are added to the students' study planner, grouped together to make them relatively easy to find. An example is shown in Figure 1 below.

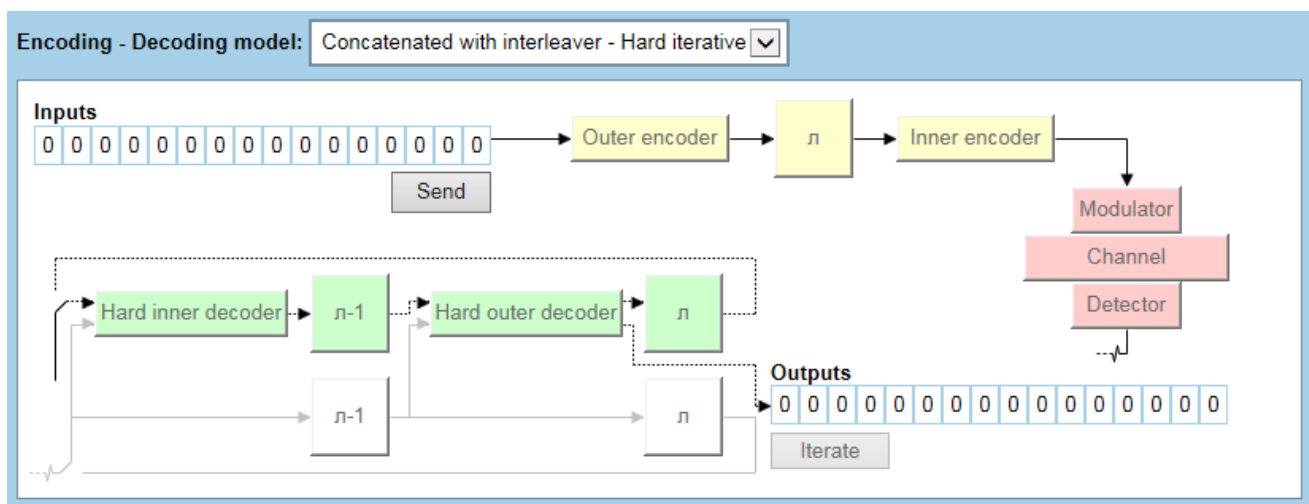


Figure 1 – Example of TM355 TELT resource (online activity)

The research was motivated by a particular examination question used in the 2017 examination. The question, on the topic of error control, was in a part of the examination paper where students had a choice of questions to answer. The question related to techniques of error control that had been taught in print, and demonstrated interactively with a TELT resource which students were strongly advised to use, but could not be compelled to use. In this study learning-analytics data was used retrospectively to investigate the use of the relevant TELT resource by students who chose to answer the question, and as an aid to framing interview questions relating to the use of TELT resources. This appears to us to be a novel use of learning analytics data.

## 2. Learning analytics

Learning analytics, in George Siemens's widely used definition, are the 'measurement, collection, analysis and reporting of data about learners and their contexts, for purposes of understanding and optimizing learning and the environment in which it occurs' (quoted in Bodily and Verbert, 2017, p. 405). The gathering and use of statistical data about learners is not new. For example, pass/fail rates and grade distributions have long been a tool of educators and educational researchers, but 'learning analytics' connotes something more than traditional performance statistics.

The development of learning analytics has largely been an outgrowth of the development of virtual learning environments (VLEs), where students' online study is conducted in a computer-based learning environment. Such an environment allows the students' progress, performance of tasks, use of resources, etc. to be recorded. Although such data could be used for monitoring an individual student, generally learning-analytics data is aggregated from many students (sometimes hundreds or thousands) in order to identify significant trends or patterns of study behaviour.

Although there has been much research in the area of data analytics in recent years (e.g. Shum and Ferguson 2012), there are questions regarding which analytic methodologies can be most effective in informing higher education teaching and learning practices (Gibson and de Freitas, 2016).

Indeed, learning analytics have also been seen as an outgrowth of the development of 'big data' movement. (Kop et al. 2017; Littlejohn 2017.) Two 'big data' applications of learning analytics have received particular attention. One is the use of learning analytics to predict students' behaviour or success. (for example, Slater and Baker 2019). The other is the use of learning analytics in conjunction with learning design to help with module revision and improvement. (Slater et al. 2016). Slater and Baker (2019) point out a potential problem with the predictive approach, which is its tendency to assume that learning is continuous and incremental, allowing extrapolations to be made. This ignores the possibility of learning being discontinuous, in which the gaining of a sudden insight produces an unpredicted shift in performance. An additional problem with the 'predictive' approach is that although it can reveal correlations, causal connections between student activity and educational progress remain unclear. The problematic nature of predictive learning analytics possibly underlies a trend identified by Viberg et al. (2018, p. 108), who report that research in learning analytics in higher education is shifting from prediction towards 'a deeper understanding of students' learning experiences.' The authors of the present paper see their work as part of this trend. Nevertheless, in so far as the present study attempts to uncover a possible correlation between use of TELT resources and examination performance, it has elements of the 'predictive' approach and the 'student experience' approach.

Two issues in particular are common to both the 'predictive' approach and the 'student experience' approach. The first of these concerns the ethics of monitoring students. Siemens (2019) refers to concerns around student privacy in connection with learning analytics and Bodily & Verbert (2017) observe that some types of learning analytics potentially reduce student autonomy as teachers and administrators increasingly become framed as managers of learners.

The second issue concerns what analytics actually represent. Analytics data comprises counts of mouse-clicks made by students to get to particular virtual learning environment (VLE) page or web pages, and, possibly, time spent on a particular web VLE page or web page. Records of clicks and time spent therefore serve as proxies for learning activities and resource use, and possibly as rather poor proxies. For instance, Macfadyen and Dawson (2010) find that time spent on educational resources, as indicated in learning analytics data, is poorly correlated with academic performance. Thus students' motivation for clicking on particular resources, and the

degree of attention students pay to them, cannot reliably be deduced from analytics data. To investigate issues of motivation and attention supplementary techniques such as surveys and interviews must be used. In the present case, interview, learning analytics data was supplemented with interviews. This appears to the authors to be a novel, or at any rate uncommon, use of learning analytics.

### 3. Method

The research questions cover two key areas; the effectiveness of the analytics tool and students' perception of the TELT resources. The methodology employed a mix of quantitative and qualitative research methods, in particular the collection of data analytics and use of semi formal interviews. Via data analytics it was possible to review when the students engaged with the TELT resources and whether at predicted times during the module. It was also possible to collect data to establish whether students revisit the TELT resources. Via individual student telephone interviews a more in-depth view could be established regarding what motivates students to engage with TELT resources, whether students understand topic more deeply as a result of using TELT resources, or if students are deterred if resources are too complicated or too time consuming.

#### 3.1 Data collection - analytics for action (A4A)

The main data analytics tool selected for the research was Analytics for Action, A4A (Hidalgo, 2018). A4A can provide detail of how students are engaging with specific online materials. Data is presented at a high level, with the aim to provide a module-level analysis of how students are engaging with online materials. The framework for application of A4A has six phases, as shown in Figure 2, that can help module teams continually review and improve student experience by identifying specific actions to be taken.



Figure 2 – A4A six phases

A4A is a visual platform, providing a summary of student performance using real-time data. For example, Figure 3 depicts student interaction with a specific online resource that relates directly to assessed material. The vertical axis represents the number of students engaging with a TELT resource, the horizontal axis represents the study weeks of the module and the light blue vertical bar represents an assignment due date. It can be seen that peak use of the related online resource ties in with the submission of the second assignment, due in week 20.

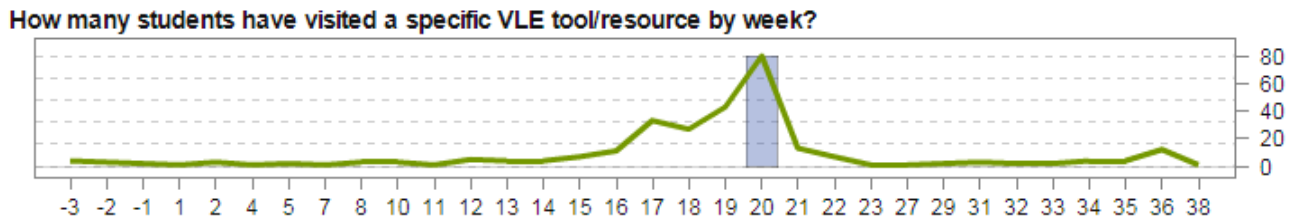


Figure 3 – Hamming codes - Online resource predominantly used in relation to assessment

In Figure 4, the use of the TELT resource has a different kind of pattern, as it is used predominantly during Block 2 of the module, between the first and second assignments (represented by the first and second vertical bars). There is also a small peak at the end of the module, suggesting that some students return to the online resource at revision time. However, the number of students engaging is relatively low, considering the cohort size of over 300 students.

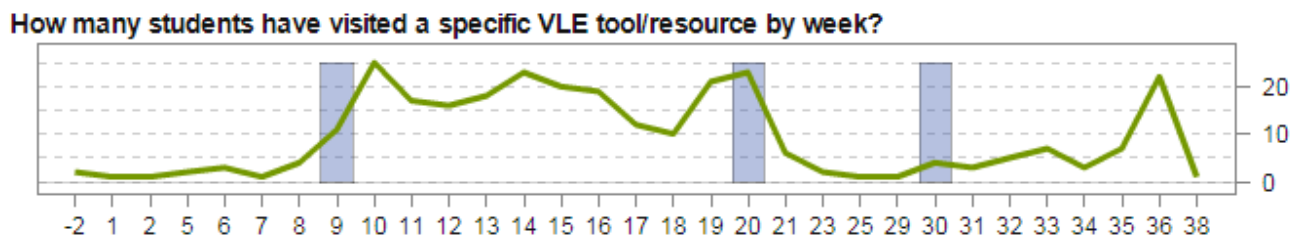


Figure 4 – Error control codes - Online resource used at specific times during a module

The A4A data can help a module team make evidence-based decisions, with the ultimate goal of improving student experience on that module (Evans et al, 2017). A limit to the usefulness of the A4A dashboard is that in its usual format it cannot identify online activity at an individual student level. In consultation with the analytics design team it was established that the underlying data could be presented at an individual student level if required, drilling down to explore the data in more depth.

### 3.2 Phases of research and ethical considerations

For this study, a sub-set of 48 students was selected, namely those who answered a specific TM355 2017 exam question on error correction. The question was not answered well resulting poor average performance. Student activity on the related TELT resource was collected and could then be mapped alongside their exam performance.

The research was conducted in three main phases. During the first phase (2017 to July 2018) a pilot study was conducted which commenced with the collection of key analytics data via A4A on TELT resource use during the 2016/17 module presentation. From this the sub-set of students was identified for further research. In consultation with analytics team this data was interrogated more deeply. The second phase was designed to supplement the analytics data via semi-formal interview questions, to help address limitations such as those noted by Macfadyen and Dawson (2010). Interviews took place July 2018 and was followed by an initial review of findings. The third phase involves action and dissemination of findings and is currently ongoing. The research was approved by the Open University’s Research Ethics Committee and has been logged as GDPR compliant. The third phase involves action and dissemination of findings and is currently ongoing.

#### 4. Results and discussion on recommendations

The following is a summary of findings from both the data analytics and student interviews.

##### 4.1 Results from A4A regarding error coding activity relating to exam

In reviewing the data relating to the TM355 students who answered the specific exam question relating to error coding, the small sample of 48 students was selected from the cohort of 329 students who sat the final examination. The data relating to their online activity with the related TELT resource was mapped alongside their examination score for the question, with results as follows:

- Average exam score overall for all students – 45%
- Not used error control codes TELT resource at all – 30%
- Used error control codes TELT during the module, at least once – 53%
- Used error control codes TELT specifically at revision May/June – 52%
- Used error control codes TELT on more than one specific date i.e. returned to package – 58 %

This snapshot relating to student performance suggests that those who engaged fully with the TELT resource did relatively well, although care should be taken to avoid confusion over correlation and causation (Ferguson and Clow, 2017).

From Figure 4 it can be seen that between weeks 9 and 20 about 200 students used the TELT resource relating to error control codes. Some of these might be students who used the resource more than once, so they are double counted in that figure of 200. Even so, although the use of the resource might be seen as disappointing, it would be reasonable to suppose that at least half the students used it in this period. That is also consistent with the 53% usage figure for students who attempted the examination question relating to error control codes. However, far fewer than half of the student cohort felt confident to do the exam question. If students distributed themselves evenly across the three optional exam questions, we could expect 66% of them to attempt the question. It is reasonable to suppose that by the time the students sat the examination they had not used the online resource for several months, unless they also used it in the revision period. From the A4A data it is possible to see that very few students used it then. It is therefore reasonable to hypothesise that students should be reminded of the importance of including the TELT resources in their revision. Engagement with the online materials should be encouraged, as they should enhance the learning experience by exposing students to a wider variety of learning techniques.

To help offset the limitations of small-scale research, the results for the focus sample in this study were compared with the wider cohort by reviewing student achievement relating to their cumulative Open University study on previous modules, as summarised in Figure 5.

**Summary Statistics**  
**Results**  
**The MEANS Procedure**

Analysis Variable : P_target_result1 Probability of student passing the module							
original_sample	N Obs	Mean	Std Dev	Minimum	Maximum	Mode	N
0	271	0.8670889	0.1349558	0.2279104	0.9876422	0.5742115	271
1	48	0.8516501	0.1430410	0.1702492	0.9850042	0.5742115	48

Figure 5 – statistical analysis of sample

To accomplish this, the student records for the focus sample were compared to all other student records from the cohort. The data set was coded as sample=1 for those who answered the particular exam question referred to in this study, and the others flagged sample = 0, so differentiating between the groups. The column p\_target\_result1 is the predicted probabilities of success for the students at module start. A comparison of the mean predictive probability in each group shows they are very similar although the sample group of 48 students is marginally weaker, as highlighted above. This suggests that even though the sample size is small there is no reason to assume that the sample group should perform any differently to the rest of the cohort.

#### 4.2 Interview results

Two sets of interviews were conducted, one for the pilot study (3 students) and one for the following cohort (5 students). The Open University engages in distance learning so face-to-face interviews were not possible, as the students are widely distributed across the UK and beyond. For the pilot study the initial plan was for interviews to be conducted via the Open University's Skype for Business system. However, during the interview period a restriction on recording external calls became evident, so interviews and recordings were completed via mobile phone. For the second cohort, interviews were conducted via Adobe Connect using its inbuilt recording facility. This had the added bonus of a visual screen, on which the online descriptions were added as an aide-memoir for the interviewees.

Several key points were highlighted by students during the interview process. For example, some students noted that the TELT resources were very good for self-testing. It was also noted that the activities provided a different way to learn rather than text and they were visual and interactive. As an example, the benefit of being able to step forwards and backwards through an animation so you can go back and check things was commented upon.

"Seeing the coding in practice and having an interaction helped".

A particular benefit relating to complex themes was noted, as the related TELT resources supplemented the written text, thus helping the students to understand the topic more fully by interacting with the online version of the materials.



"The sequence of coding and decoding is explained in the book and this is done quite well, but the activities help you to do that for real and allow you to apply the theory".

It was also noted that the online resources were useful in providing a high-level summary, as large sections of the printed materials (2 or 3 pages) could be summarised in a paragraph or two of the online activity. This reinforces the suggestion of highlighting use of the TELT resources for revision, where students need to best utilise the time available. An issue noted was the lack of information regarding the estimated time for engaging with the online activities. The notional time needed varied between activities and this could not be determined unless actually engaging with the activity.

Although student perception of the TELT resources was generally positive there were also more negative responses, for example the following relating to the 'Launching a wave' activity.

"It was hard to understand the direction of the dipole and how it was radiating waves".

The student found it difficult to work out what was happening. A slightly different animation showing which direction was which could have helped the student's understanding, so this is a further idea to progress.

#### **4.3 Discussion on recommendations and actions**

Referring to Figure 2, the A4A framework was adopted in order to focus on possible improvements relating to the student experience on TM355. The initial review of A4A data revealed that some students were using the online activities effectively to support their study of printed module materials, although many students did not fully engage. A particular issue was highlighted after the 2017 examination, so further analysis of the data was undertaken which suggested that those students who utilised the TELT resource associated with the examination question performed slightly better, although it should be noted that these results should be treated with some caution. Further action was taken by conducting a series of student interviews to gain further insight into their perception of the use of these activities.

The findings from this study suggest that there are several actions that could be taken, for example:

- Give a clearer indication of time needed for the TELT activities (although obviously this will vary for each student).
- Add short descriptions about what kind of activity it is, for example interactive, video.
- Promote the activities in a new module introductory or revision video or podcast.
- Use the module forums to promote them
- Have 'talking heads' of students saying how useful they were.
- Add further detail to the introduction to certain activities, for example to explain the orientation in the 'launching a wave' activity.

Several of these ideas suggested via the interviews have already been implemented and others could be actioned in the future. For example. Figure 6 depicts a section of a resource that has been produced to give students an overview of the activity type and typical timings, alongside a direct link to the activity and an indication on where it fits in the student study calendar.

Block	Part	Week	Online Activity	Activity Name and module link	Short Description	Estimated Time Req.
1	1	1-3	1.1	<a href="#">Fourier Transforms</a>	Interactive activity showing time-domain representation and frequency-domain representation for sine, square, <u>sawtooth</u> and triangular waveforms.	15-30 mins

Figure 6 – TM355 TELT resource description and timing example

Also, a new revision podcast has been produced which specifically promotes the use of the TELT resource at revision time, hopefully resulting in more students revisiting the online resources.

## 5. Conclusions

Data analytics can prove useful in analysing student performance and in modifying a module in the light of what is revealed. However, as with any statistical data, interpretation is required. Data analytics do not 'speak for themselves'. Establishing the significance of analytics data is likely to require the use of additional strategies, of which interviews are an example. The example discussed here revealed some of the limitations of aggregated data. Knowing that a certain percentage of a student cohort did not do a particular activity could raise an alarm about the activity, but typically one would need to know more about the group of students identified. In what ways might they be representative or unrepresentative of the cohort? Pursuing this question is likely to require drilling down to data about individual students, which can be (as in the present case study) beyond what the analytics tool is intended to do, and might raise ethical concerns We see here another version of the 'prediction versus student experience' dilemma face by designers and users of data analytics tools.

In the present case study, follow-up interviews revealed the puzzling inconsistency that the TELT resources are considered useful but are under-utilised, particularly during the revision period. This fact indicates a clear course of action for the creators of the module, which is to urge students not to confine their revision solely to the printed texts, which contain the bulk of the teaching material. A revision advice podcast, newly introduced, stresses this and gives other revision advice.

Our general conclusion from this case study is that learning analytics have undoubtedly proved useful for tracking student engagement, but have required a certain amount of 'hand-crafting' to extract additional information that is not routinely available, and supplementary interviews to shed light on the potential significance of the data gleaned.

## 6. References

Bodily, R. & Verbert, K. (2017). Review of Research on Student-Facing Learning Analytics Dashboards and Educational Recommender Systems. *IEEE Transactions on Learning Technologies*, 10(4), 405-418

Evans, G., Hidalgo, R. & Calder, K. (2017). Analytics for Action –enabling in-presentation evidence-based change on OU modules. *Quality Enhancement Report Series Issue No 2017/7*

- Ferguson, R., & Clow, D. (2017, March). Where is the evidence? A call to action for learning analytics. In *LAK'17 Proceedings of the 7th International Learning Analytics & Knowledge Conference* (pp. 56–65). Vancouver, BC.
- Gibson, D. & de Freitas, S. (2016). Exploratory analysis in learning analytics. *Technology, Knowledge and Learning*, 21 (1). pp. 5-19.
- Kolb, D.A. (1984). *Experiential learning: experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice Hall.
- Kop, R., Fournier, H. & Durand, G. (2017). A Critical Perspective on Learning Analytics and Educational Data Mining. In Lang, C., Siemens, G., Wise, A., & Gašević, D. (Eds) *Handbook of Learning Analytics, Society for Learning Analytics Research, 2017*, pp.
- Herodotou, C., Gilmour, A., Boroowa, A., Rienties, B., Zdrahal, Z. & Hlosta, M. (2017). Predictive modelling for addressing students' attrition in Higher Education: The case of OU Analyse. In *CALRG Annual Conference 2017*, 14-16 Jun 2017, The Open University, Milton Keynes, UK.
- Hidalgo, R. (2018). Analytics for action: Using data analytics to support students in improving their learning outcomes. In G. Ubachs & L. Konings Eds. *The envisioning report for empowering universities*(2nd ed), European Association of Distance Teaching Universities, Maastricht, Netherlands (pp. 6–8)
- Littlejohn, A.(2017). Learning and Work: Professional Learning Analytics. In Lang, C., Siemens, G., Wise, A., & Gašević, D. (Eds) *Handbook of Learning Analytics, Society for Learning Analytics Research, 2017*, pp 269-277
- Macfadyen, L. P.& Dawson, S. (2010). Mining LMS Data to Develop an "Early Warning System" for Educators; a Proof of Concept. *Computers and Education*, 54, pp. 588-599
- Slater, N., Peasegood, A. & Mullen, J. (2016). *Learning Analytics in Higher Education, JISC report*. Retrieved from <https://www.jisc.ac.uk/reports/learning-analytics-in-higher-education>
- Shum, S. B., and Ferguson, R. (2012). Social learning analytics. *Educational Technology and Society*,15, 3–26
- Siemens, G. (2019). Learning Analytics and Open, Flexible and Distance Learning. *Distance Education*, 40(3), 414-418
- Slater S. & Baker R. (2019). Forecasting Student Master. *Distance Education*, 40(3), 380-394.
- Tempelaar, D. T., Rienties, B., & Giesbers, B. (2015). In search for the most informative data for feedback generation: learning analytics in a data-rich context. *Computers in Human Behavior*, 47, 157e167. <http://dx.doi.org/10.1016/>
- Tempelaar, D., Rienties, B. & Nguyen, Q. (2017). Towards actionable learning analytics using dispositions. *IEEE Transactions on Learning Technologies*, 10(1) pp. 6–16.
- Viberg, O. Hatakka, M. Bälter & Mavroudi, A.(2018). The Current Landscape Analytics in Higher Education. *Computers in Human Behavior*, 2018, 98-110

## Attesting and Certificating university teachers' professional and digital competencies

### Marianne Helfenberger

Swiss University of Distance Learning, Switzerland  
[marianne.helfenberger@fernuni.ch](mailto:marianne.helfenberger@fernuni.ch)

### Paz Prendes-Espinosa

University of Murcia, Spain  
[pazprend@um.es](mailto:pazprend@um.es)

### Isabel Gutiérrez-Portlán

University of Murcia, Spain  
[isabelgp@um.es](mailto:isabelgp@um.es)

### Abstract

Much is being discussed about the need for developing the digital competencies of university teachers from all disciplines. But less has been said about how to recognize and attest them. In this paper we will present and discuss different options to identify, develop and attest or certify those competencies. We depart from a concept of profession that includes both the researcher and the teacher. Further, we understand digital competencies as overall competencies within any domain of teaching competencies. Competencies may be acquired formally or informally, they may become visible through learning material output, and they may be identified or evaluated by different actors. The more perspectives can be activated to identify and evaluate university teachers' competencies, the more precise becomes their professional image. Thus, attesting and/or certifying university teachers' competencies can be the result of for example tests, student evaluations, self-evaluations or peer-reviews. We have developed ideas and models to provide for attestations and/or certificates from multiple perspectives. Those are a) a model based related to management, teaching and research competences taking into account the relevance of digital competences, plus a certification model based on different levels and external evaluation; b) a model for a competence framework-app as self-evaluation tool for university teachers departing from a database of empirically validated competencies, and c) an open source educational repository to promote peer-valuing digital academic educational products.

**Keywords:** Digital Competence Framework, Certification Instruments, Self-Evaluation, Higher Education

### 1. Introduction

"Today's students have a problem, and it's not the one written on the board. They're so accustomed to constant stimuli from smartphone apps and streaming platforms that they can't concentrate in class" (<https://www.bbc.com/worklife/article/20190220-how-can-a-distracted-generation-learn-anything>).

This and many other statements about the negative consequences of digitalization do not only address children's individual learning behavior. They also go along with a series of policies to prevent damage and to educate children and educators to deal with them. On the other hand, technology enthusiasts emphasize the unlimited possibilities and opportunities that digitally educated citizens have for themselves and for society's progress. Historically, this phenomenon is not new. Ever since, technological innovations have provoked hopes and fears, and with them controversies, research, policies and practices. NGO's engage in discourses

questioning digitalization as a process that menaces humanity (e. g. Caritas Schweiz, 2019). Critical research sees democratic societies endangered, diagnoses and forecasts digital divides that fragment society vertically and intersectionally, and that distort electoral processes or undermine the middle class (Andreasson, 2015; Goffart, 2019; Ridout, 2019). Alexander and Pal (1998) published an early overview of digitalization's key political implications and debates balancing expectations, challenges and pitfalls. Thus, furthering sustainable digital preservation of public material is more than a technical issue also a cultural and political imperative to preserve society's intellectual and cultural heritage as Myntii and Zoom's sample of strategies and best practices demonstrates (Myntii & Zoom, 2019).

Today, digitalization as a social phenomenon has reached all societal sectors and has provoked numerous policies in political and educational fields all around the globe. Nation state governments, federal states or regions within a nation state and local state or administration units engage in digitalization policies aiming at managing administration more efficiently and in the name of democracy. Researchers engage in analyzing, understanding digitalization and practitioners in realizing it. Digitalization can be seen as means of boosting economy and entrepreneurship (Weiss, 2017) or of constructing national identity and cohesion by implementing broadband internet (Eaton, 2011). Spain's autonomous regions developed digital education programs for citizens (Durán, Prendes & Gutiérrez, 2019) aiming at implementing the digitalization policies from the European Union which are crystalized in *DigComp*, the competence framework for citizens' education and for democratization of access to digitalization (Redecker & Punie, 2017). The concept of 'e-government' does not only imply digitalizing governments in an administrative sense as a "transition from paper-based to electronic styles of working" (Mettler, 2019, p. 178). Beyond administration issues, it is linked to expectations about societal transformation. Thus, digitalization would and should transform the relationship between the state and its citizens, improve public services, and further individual mobility and empowerment (Mărcuț, 2017; Mettler, 2019).

In face of these alleged or real threats and challenges, societies historically rely on education and -especially since the rise of massive schooling in the 19<sup>th</sup> century- on educational institutions as solution to societal problems. This phenomenon represents the paradigm of modernity that provides an "adapted socialization" relying on the "perception that social problems could and would be solved by education" (Depaepe & Smeyers, 2008, p. 1). Depaepe and Smeyers call it "educationalization" meaning "transferring (...) 'social' responsibility to the school" beyond the traditional school curriculum.<sup>1</sup> In exchange for obedience towards authority, educationalization promises opportunity to acquire a good position and social mobility (Depaepe & Smeyers, 2008). Both good position and social mobility are values associated with ideals of a democratic society. Thus, digitalization as a set of skills and values related to democratic, humanistic, societal, economic, political and cultural values becomes integrated into any national school curriculum to promote not only technical mastering digital tools but also their integration into a vision of "school for life". Teachers from primary to higher education are not excluded from educationalization processes: delegating social tasks to schools implies automatically questioning teachers' skills for those new challenges leading to policies and qualification offers to prepare them. Last, but not least, research engages in the production of theoretical models to respond to societal demands. We will exemplify some fundamental pitfalls of such theoretical models that originate in debates about citizen education and primary and secondary school teachers but are also used in discourses about university teachers. We will limit this illustration to the very popular and still influential TPACK (Technological, Pedagogical, and Content Knowledge) by Mishra and Koehler (Mishra & Koehler, 2006). The

---

<sup>1</sup> Educationalization can affect any societal issue; as illustration of the case see (Sullivan, 2018).

authors understand TPACK as a set of three interacting knowledge systems that come into play in educational settings: content, pedagogic and technological knowledge.

Despite of TPACK's advantages, the model does not reflect its normative premises and defines the knowledge fields inexactly. As examples for its normativity serve its overstatement of technology's knowledge rapid change disregarding that scientific content develops as rapidly influencing epistemologies as much as technological knowledge, and addressing pedagogy as "advanced" or "commonplace" depending on their use of new or old technologies (Mishra & Koehler, 2006, p. 1028). Defining *technical pedagogical content knowledge* (TPCK) as "the basis of good teaching with technology" (Mishra & Koehler, 2006, p. 1029) suggests that all students' learning depends on the teacher and his or her well prepared pedagogical setting, thus, it neglects students' heterogeneity and individual learning dynamics as co-factors of students' success. Finally, TPACK as analytical tool goes along with a deductive method that can predetermine the results as desired learning outcomes. As the authors state, TPACK offers a language to interpret what we observe. With Foucault though (Foucault, 1991), we should keep in mind that language determines what and how we think and that language also acts as collective mechanism to include or exclude norms and values that are inherently subjective, culturally informed and not universal.

Besides all these potential pitfalls of TPACK or any other theoretical model of any kind of competencies, applying them to university teachers represents a major challenge, especially if attesting or certifying their digital-pedagogical competencies is at stake. Much is being discussed about the need for developing the digital competencies of university teachers from all disciplines. But less has been said about how to recognize and attest them. Conscious of the "risk that educational researchers are seduced by the government's policies and fail to notice that the strategies they generate all too often perpetuate the very social injustices they are intended to overcome" (Watts, 2008, p. 153), we engage in this paper in the conceptualization of academic profession and competence frameworks envisioning citizens participating in 21<sup>st</sup> century societies, proposals for attesting or certifying university teachers' digital competencies based on empirically validated models, and concluding remarks.

## **2. Academic profession and competence frameworks**

In face of digitalization, societies engage in international and national education policies, regional or local curricula and institutional practices to develop individual and collective digital competencies. The European Union released the competence framework *DigComp*, Spain's autonomous regions developed their own programs for digital citizen education (Durán et al., 2019), *Swissuniversities*, the umbrella organization of Swiss universities<sup>2</sup>, launches periodically research and development projects to promote digital skills at university level, professional associations and institutions engage and implement their own development strategies. These are only a few examples of policies and practices aiming at professionalizing university teachers by developing their digital skills and competencies.

Durán, Gutiérrez and Prendes (2016a) analyzed and discussed a representative, carefully and systematically chosen, sample of theoretical models of teachers' technological competencies at international and national level. Those models contain common and differentiating elements. They all address digital competencies for citizens, teachers and university professors. 21<sup>st</sup> century citizenship in general requires competencies that are relevant for everyday life and therefore can be approached from a primarily technological perspective; they include the fields of technology, communication and information, the capacity to exploit the educational

---

<sup>2</sup> <https://www.swissuniversities.ch/en/>



potential of technology and the capacity to innovate educational processes incorporating technologies effectively. Teachers digital competencies include technologies for the use in teaching settings. All models agree therein that university professors profile is more complex and that the definition of their digital competencies needs to include three fields of action: teaching, research and administration (Durán et al., 2016a). From this analysis, the authors (Durán et al., 2016a) developed a proposal for a comprehensive model of digital competencies for university professors that includes the following dimensions:

- Technology, communication, information, multimedia, security and problem solving as minimum requirements for citizens;
- Specific dimensions for teaching activities supported by technology such as management teaching, evaluation of students learning success, exploiting technology's didactic potential, technology training, facilitating learning and creativity by using technology;
- Specific dimensions related to university professors' profile such as research, pedagogic innovation, diffusion and publication of academic output in the web.

In 2016 the authors revised their own model and they defined 10 areas of digital competence for university teachers, with a total of 46 competence descriptors. With these elements, they built a model with three levels of domain: level 1, referred to basic skills to use ICT in general (technical and practical skills); level 2, in relation to design, implementation and evaluation with ITC as main tools; and level 3, relative to the analysis, reflection and critical thinking about the own actions with ICT. Taking this model into account, the authors defined 72 indicators of evaluation useful to implement certification tests for university teachers (Durán, Gutiérrez & Prendes, 2016b). In a more recent research, the model was revised adding a new systematic revision and finally Prendes, Gutiérrez & Martínez (2018) elaborated a second version of their digital teachers' competence model (see figure 1) with five levels of domain relative to digital competence. This model can be the base for different approaches to digital competence of teachers, not only in the higher education system because we can adapt it to different cultural contexts or different educational levels. And it can be the starting point for the reflection about how our institutions are and where they can arrive in relation to digital advances, digital society and digital labor market.

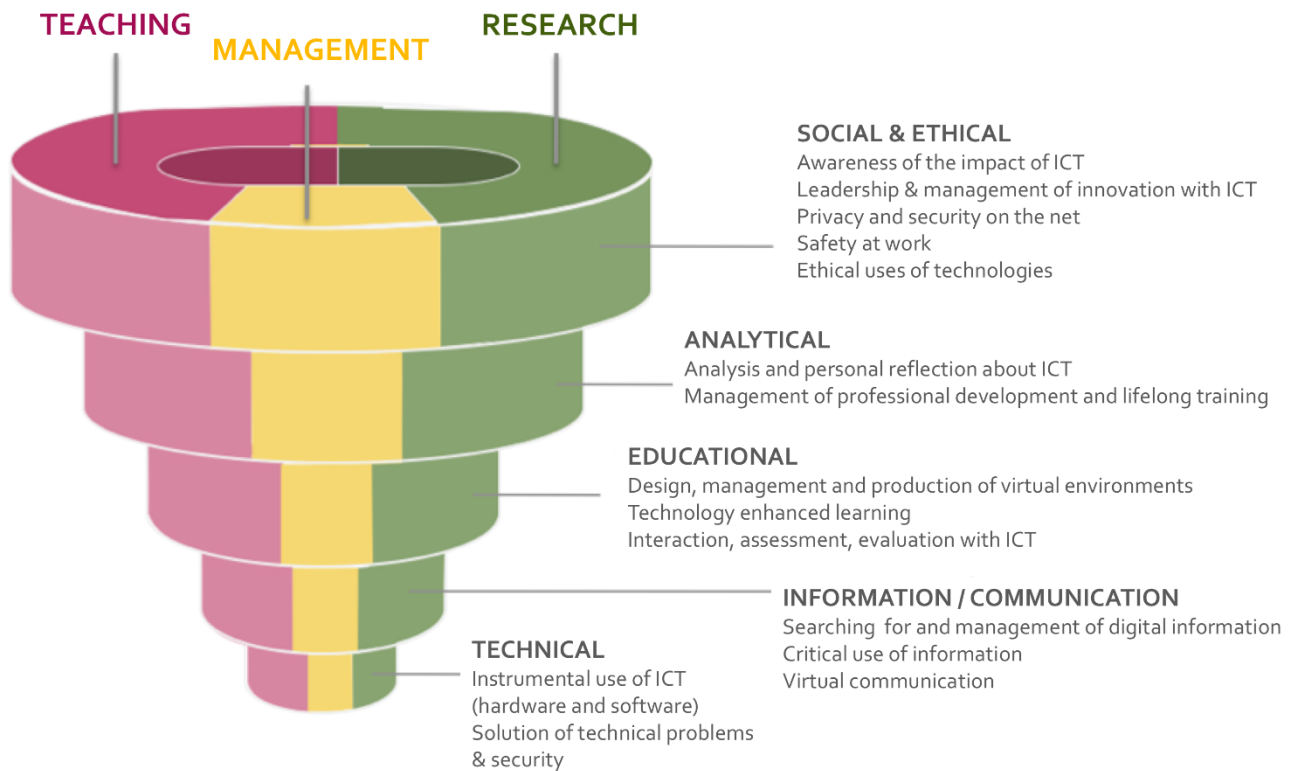


Figure 1: Model of Digital Competence for University teachers (Prendes, Gutiérrez & Martínez, 2018, p. 14)

Helfenberger developed a professional competence framework containing digital-pedagogical competencies *within* other professional domains. She departed from the fact that university professors and teachers have a double role as researchers and teachers. As such, they act in institutional and scientific communities that require technical skills attributed to different taxonomy levels. Since university professors and teachers have the highest possible degrees of qualification, she assumes that they possess at least basic digital skills. However, she agrees with other competence models (see chapter 2) therein that isolated digital skills are pedagogically irrelevant if they are developed and certified for themselves. Thus, she eliminated competence indicators from her framework that address only technical skills. The framework consists in six main domains of academic professionalism and professional action fields that are not limited to the employer institution: *teaching and learning*, *evaluation* of students learning outcomes and teachers' reaction to them, *students' empowerment*, *participating in academic community*, *institutional commitment*, and *professional commitment*. The number of generic competencies within a domain and of indicators within a competence varies. The *digital competence* domain is placed within each of the other domains because its skills and competencies may be applied in different professional action fields (see table 1).

Table 1: Professional competence framework (Helfenberger).

Competence area	Description
Teaching and learning	The "teaching and learning" competence area focuses all competences related to planning of modules/courses, student learning monitoring, their support, evaluative and administrative finalization of courses/modules. Main core of this area is effective, innovative and varied combination of analog and digital materials and activities in different learning scenarios.

Evaluation	The "evaluation" competence area includes all competencies related to formative and summative evaluation, student feedback and learning progress. Also included are skills related to the self-evaluation of teaching staff and understanding and responding to students' evaluation of teachers' performance. Evaluation includes both analog and digital media.
Empowerment	The "empowerment" competence area includes all teachers' competencies oriented towards students' autonomy, inclusion, personalization and disciplinary activation to provide them with the necessary skills for their discipline, life in society and labor market.
Academic community	The "academic community" competence area encompasses all skills related to participation and sharing of research, academic, scientific and educational output especially in digital spaces in favor of their work as university teachers.
Institutional commitment	The "institutional commitment" competence area includes all skills manifested in collaboration with various institutional departments and in usage and development of the institutional digital spaces.
Professional commitment	The "professional commitment" encompasses all competencies oriented towards disciplinary, pedagogic and digital continuous education, pedagogic innovation with or without digital media, respect towards students, positive attitudes towards pedagogical-digital challenges, etc.
Digital competence	The field of "digital competence" includes all competences related to selection, production and sharing digital resources for teaching and learning and interaction with technology.

Generic competencies and their indicators of the digital domain are limited to those competencies that address digital-pedagogical issues and exclude those that refer to basic technological skills. The argument is that research competence in general and digital skills and competencies in research are already developed and certified by the "home university" that offered masters and doctoral degrees. Thus, it makes sense to concentrate on identifying, developing and attesting digital-pedagogical competencies. Acquiring digital-pedagogical competencies can be measured quantitatively (amount of different digital competencies per professional domain) and qualitatively (taxonomical definition of digital-pedagogical competencies). Figures 2 and 3 represent a possible digital competence profile according to Helfenberger's framework.

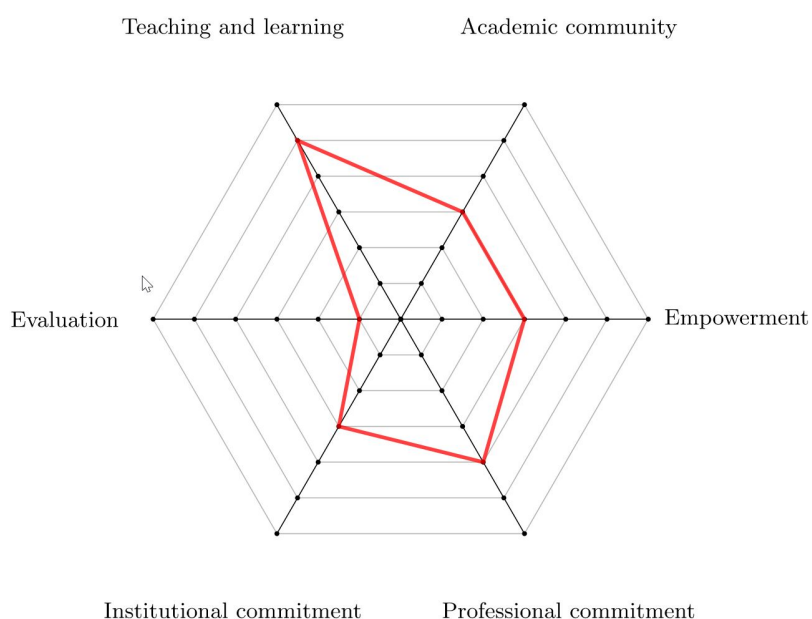


Figure 2: Example of a competence profile distributing digital competencies (red) within a professional framework.

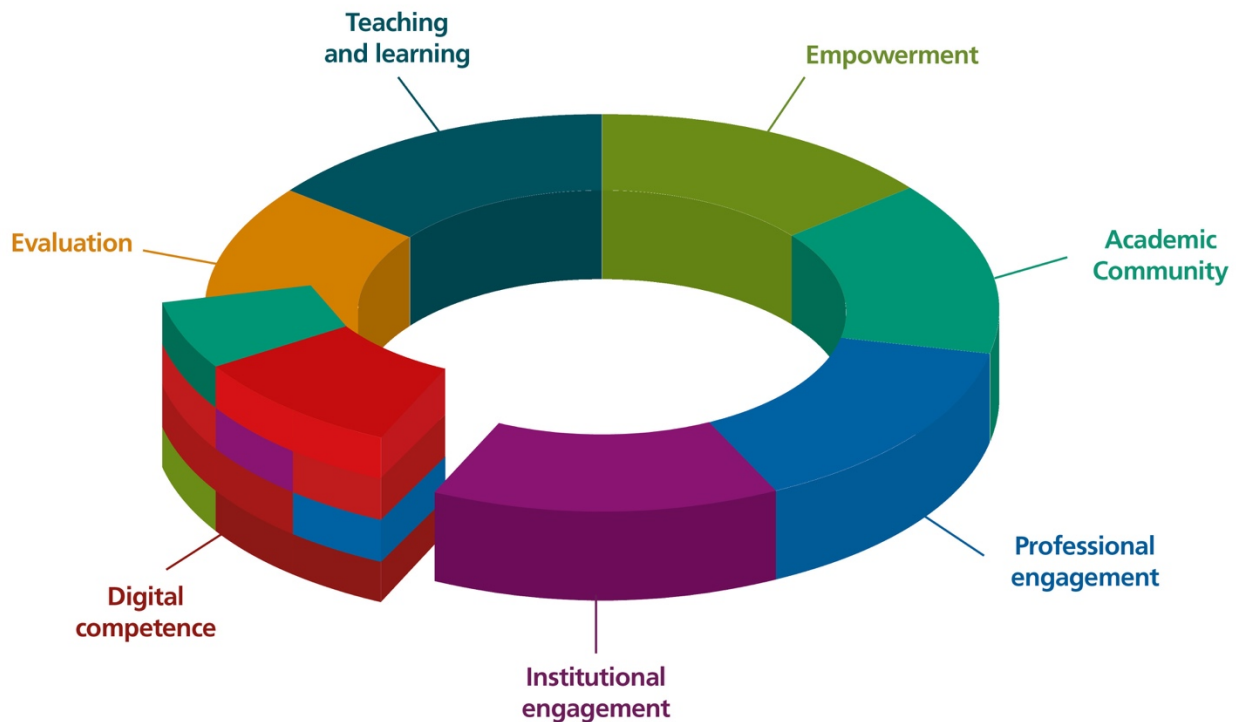


Figure 3: Example of personal competence profile attributing taxonomies (bottom to upper levels) to digital competencies (red block) distributed throughout the personal professional areas of competence (colors of elements within the digital taxonomy correspond to competence area colors; red blocks are digital competences from the framework that this profile has not acquired).

Our two models have in common that they intertwine digital and pedagogical dimensions including the double role of university professors as researchers, as teachers and as members of different communities. The first model is based on indicators of cognitive taxonomy levels through teaching, research and management as university teachers' core institutional fields of action. The second model is based on a concept of profession that departs from personal professional fields of action directed towards students, communities and oneself as professional. Both models are complementary and adaptable to other contexts. Both lead us to conceptualize instruments aiming at attesting or certifying university teachers' digital competences to further comprehensive views of the profession in general and particularly of individuals.

### 3. Attesting and certifying university teachers' digital competence

Based on the exposed competence frameworks, we present here three proposals for attesting university teachers' competencies: one standardized instrument that produces an automatic output once teachers have filled in the evaluation form; one tool for teachers to construct their own learning and developing paths; and an educational repository to give their pedagogic output web visibility using analytics to understand certain digital competencies. Together they can add to a more comprehensive view of competencies and be a base for attests and certificates.

#### 3.1 Digital Competence for University Teachers: model to understand, to evaluate and to certificate

This is a model based on a theoretical approach built after a complete systematic review, as we have explained above. Based on this review, the authors designed a proposal to analyze the role of university teachers, but also a proposal to evaluate their digital competence and moreover to certificate it with a valid instrument. They recognize five dimensions (technical, informational, educational, analytical, socio-ethical), three fields to

apply (research, teaching and management) and three levels of domain (from basic to expertise). See Durán et al., 2016a, 2016b; Prendes et al., 2018; Durán et al., 2019.

### 3.2 Competence framework application as self-positioning tool

Departing from a data base containing Helfenberger's framework, we are developing an application that permits to search the data base according to the following criteria among others: Competence indicators

- per competence area aiming at developing specific areas (long term temporality),
- that are especially relevant in specific phases during the realization of an academic course (determined time interval),
- related to specific tools or tool groups that may serve to develop digital competence,
- according to a taxonomy of digital competence.

Based on these search criteria, university professors can autonomously engage in developing their professional profile in their double role as researchers and teachers within and beyond their employing university. By joining formal and informal training opportunities, they can collect diverse attestations and certificates and demand institutional recognition and valuing of their competencies.

### 3.3 Open source educational repositories to promote peer-valuing digital academic educational output

Institutional repositories retrieve, administer and provide access to a community's intellectual output. Such a community can be completely or partially open to other smaller or larger communities. Repositories expose, visualize and value academic output; they can magnify its impact and provide for a certain degree of measuring that impact. Most frequently, repositories serve the diffusion and visualization of scientific research (Gibbons, 2004; Hockx-Yu, 2006; Mgonzo & Yonah, 2014; Rand & Stager, 2018; Sterman & Borda, 2017). University libraries have always kept record of theses at all levels of diplomas. But they are mostly kept locally or in the best case nationally. Usually they are not digitalized except for published master or PhD theses. Publishing open source is expensive and individually not always affordable. Thus, universities and research institutions develop software and platforms aiming at responding to the demands of academic and scholarly communities to provide low-threshold dissemination of their research materials and output. And they also engage in research to determine web-user's behavior and success of open source repositories (e.g. Mgonzo & Yonah, 2014).

Less frequently, repositories are conceived and used to meet academic educational needs and to disseminate universities' educational output. As the case of Educate-it at the University of Utrecht shows, educational repositories facilitate diffusion and exchange of university teachers' digital-educational output in favor of teaching and learning procedures in general and specifically of innovation.<sup>3</sup> Due to interactive and differentiated search, graphic interface, diverse access routes to information, and meta data, educational repositories facilitate access to academic educational knowledge that is reusable. Together with a platform, educational repositories can trigger educational-disciplinary debates and institutions gain web-visibility as educational institutions in addition to their research visibility (Sterman & Borda, 2017). An open source educational repository requires that each published material (videos, presentations, texts, tools, etc.) becomes a Digital Object Identifier (doi) and that different citation formats such as BibTex, EndNote and others are downloadable. Before publication, we propose that each repository input should be private by default. Participants should be able to create working groups within the repository before publishing their individual or jointed work. An academic educational repository could not only motivate university teachers to engage in

---

<sup>3</sup> <https://uu.figshare.com/>

academic pedagogic debates and digital-pedagogic practices, thus providing opportunities to develop digital-pedagogical competencies. By attributing permanent links (doi), academic disciplinary-educational output is protected against plagiarism and educational work becomes added value.

Abundant research exists on construction of repositories in general and on the use of big-data analytics with regard to financial analysis and profiling but less on "big data infrastructures as an ecosystem" to understand individual online behavior. (Yassaee, Mettler, & Winter, 2016) In education, most research on data analytics is learners development by using "learning analytics to increase the efficiency and effectiveness of educational processes" (Seufert & Meier, 2018). Thus, repositories are potentially significant sources from which to answer a great variety of questions via analytics. Helfenberger proposes to launch an open source pedagogic repository at *Swiss Distance University* a) that will serve the above exposed goals, and b) that can be explored to determine its explanatory value regarding the significance of users' interaction with the pedagogic-digital data. Focusing end-users' behavior instead of only faculty (Hwang, Elkins, Hanson, Shotwell, & Thompson, 2019) could differentiate content and meaning of citation, share and download analytics used in research repositories to augment their significance to track, promote and report the impact of university teachers' digital-pedagogical activity and output. Further research is planned to test the repository's empirical validity and explanatory power regarding university teachers' pedagogic-digital competencies beyond numeric data.

#### 4. Conclusions

Competence models evolve with society's changing demands. Thus, teachers' professionalism at all levels of the education system is constantly challenged. Governments and public offices launch top-down educational policies. Demands for social and international mobility activate international organizations to develop reference frameworks. Numerous and differentiated models exist. No matter how "universal" they pretend to be, they all remain culturally bound. Their utility lies in its adaptability to other contexts to respond to local demands rather than developing local curricula and frameworks to match overarching models. Our models emphasize that teachers' responsibility is not limited to classroom settings and to their relationship with students; their responsibility includes institutional, societal and personal fields of professional action. Our models demonstrate that competence frameworks and certification instruments are complementary and not mutually exclusive. They permit to prioritize individually the personal field of professional action a teacher wants to develop or one that is institutionally required to acquire. Our instruments to attest or certificate digital competencies, as instruments that serve teachers to position themselves within a professional area, empower teachers to develop themselves as teachers and professionals.

#### 5. References

- Andreasson, K. J. (Ed.). (2015). *Digital divides: the new challenges and opportunities of e-inclusion*. Boca Raton, London, New York: CRC Press, Taylor & Francis Group.
- Caritas Schweiz. (2019). *Digitalisierung - und wo bleibt der Mensch?* (M. Specker, Ed.). Luzern: Caritas-Verlag.
- Depaepe, M., & Smeyers, P. (Eds.). (2008). *Educational research: the educationalization of social problems*. Dordrecht: Springer.
- Durán Cuartero, Marta; Prendes Espinosa, María Paz; Gutiérrez Porlán, I. (2019). Certificación de la competencia digital docente: propuesta para el profesorado universitario. *RIED. Revista Iberoamericana de Educación a Distancia*, 22(1), 187–205.
- Durán Cuartero, M., Gutiérrez Porlán, I., & Prendes Espinosa, M. P. (2016). Análisis conceptual de modelos de competencia digital del profesorado universitario. *Revista Latinoamericana de Tecnología Educativa*, 15(97–114), 1–16. <https://doi.org/10.17398/1695>



- Eaton, T. N. (Ed.). (2011). *Digital nation: broadband Internet adoption in the United States*. New York: Nova Science Publishers.
- Foucault, M. (1991). *Die Ordnung des Diskurses* ([Lizenzaus]). Frankfurt a.M.: Fischer. Retrieved from <http://www.ub.unibas.ch/tox/HBZ/HT003892434/PDF>
- Gibbons, S. (2004). Establishing an Institutional Repository. *Library Technology Report*, 40(4), 11–14.
- Goffart, D. (2019). *Das Ende der Mittelschicht: Abschied von einem deutschen Erfolgsmodell* (2. Auflage). München: Berlin Verlag.
- Hockx-Yu, H. (2006). Digital preservation in the context of institutional repositories. *Program: Electronic Library and Information Systems*, 40(3), 232–243.
- Hwang, S.-Y., Elkins, S., Hanson, M., Shotwell, T., & Thompson, M. (2019). Institutional Repository Promotion: Current Practices and Opinions in Texas Academia. *New Review of Academic Librarianship*, 0(0), 1–18. <https://doi.org/10.1080/13614533.2019.1587483>
- Mărcuț, M. (2017). *Crystalizing the EU digital policy: an exploration into the digital single market*. Cham, Switzerland: Springer.
- Mettler, T. (2019). The Road to Digital and Smart Government in Switzerland. In S. Nahrath (Ed.), *Swiss public administration : making the state work successfully* (pp. 175–186). Cham: Palgrave Macmillan.
- Mgonzo, W. J., & Yonah, Z. O. (2014). Design and Development of a Web Based Digital Repository for Scholarly Communication: A Case of NM-AIST Tanzania. *International Journal of Knowledge Content Development & Technology*, 4(2), 97–108.
- Mishra, P., & Koehler, M. J. (2006). Technological pedagogical content knowledge: A framework for teacher knowledge. *Teachers College Record*, 108(6), 1017–1054.
- Myntii, J., & Zoom, J. (Eds.). (2019). *Digital preservation in libraries : preparing for a sustainable future*. Chicago: ALA editions.
- Rand, D., & Stager, L. (2018). Promoting and Tracking Institutional Scholarship with Implementation of a Librarian-Curated Digital Repository and Research Information Management System. *Medical Reference Services Quarterly*, 37(4), 375–385. <https://doi.org/10.1080/02763869.2018.1514904>
- Redecker, C., & Punie, Y. (2017). *European Framework for the Digital Competence of Educators: DigCompEdu*. Publications Office of the European Union. <https://doi.org/10.2760/159770>
- Ridou, T. N. (Ed.). (2019). *New directions in media and politics* (Second edi). New York, London: Routledge.
- Seufert, S., & Meier, C. (2018). Big Data in Education: Supporting Learners in Their Role as Reflective Practitioners: Emerging Technologies for Teaching and Learning. In *Lecture Notes in Educational Technology* (pp. 103–123). [https://doi.org/10.1007/978-981-13-0650-1\\_6](https://doi.org/10.1007/978-981-13-0650-1_6)
- Sterman, L. B., & Borda, S. (2017). Making Visualization Work for Institutional Repositories: Information Visualization as a Means to Browse Electronic Theses and Dissertations. *Journal of Librarianship and Scholarly Communication*, 5, eP2140. <https://doi.org/10.7710/2162-3309.2140>
- Sullivan, T. L. (2018). *The Educationalization of Student Emotional and Behavioral Health : Alternative Truth*. S.l., Basingstoke, Secaucus: Palgrave Pivot [Imprint], Palgrave Macmillan Limited, Springer [Distributor].
- Watts, M. (2008). Higher Education and Hyperreality. In P. Smeyers & M. Depaepe (Eds.), *Educational Research: the Educationalization of Social Problems* (pp. 141–156). Dordrecht: Springer.

Weiss, T. (Ed.). (2017). *Digital Kenya: an entrepreneurial revolution in the making*. London: Palgrave Macmillan.

Yassae, M., Mettler, T., & Winter, R. (2016). Using affordance analysis to design individual analytics ecosystems, (periodical), 11. Retrieved from [http://media.swissre.com/documents/RiskDialogueSeries\\_desease.pdf](http://media.swissre.com/documents/RiskDialogueSeries_desease.pdf)

## Beyond the VLE: transforming online discussion and collaboration through Microsoft Teams

Edmund Hewson

Leeds Beckett University, United Kingdom

[E.hewson@leedsbeckett.ac.uk](mailto:E.hewson@leedsbeckett.ac.uk)

Gar Wai Chung

Leeds Beckett University, United Kingdom

[k.w.chung@leedsbeckett.ac.uk](mailto:k.w.chung@leedsbeckett.ac.uk)

### Abstract

Microsoft Teams is a new collaborative working and digital community platform launched in 2017 as part of the Microsoft Office 365 suite of applications. It provides an online space ideally suited for collaboration and streamlining communication for anyone involved in online learning and teaching in Higher Education. In the Distance Learning Unit (DLU) at Leeds Beckett University, Teams has been piloted used as part of a University-wide pilot project to help transform the way we work with both staff and students, both on distance and classroom courses. This presentation will outline the wider context of the Teams pilot in the University and then how it is being trialled as a potential replacement for other collaborative platforms. As an early adopter, the Distance Learning Unit has experimented with Teams to improve communication, collaborative working, and sharing of best practice within the team. The presentation will then focus on how these lessons have been applied in working with the Course Team and students on a fully online distance learning course to help boost student engagement, develop a more active learner community, facilitate collaborative working, enhance resource sharing and provide a more accessible, mobile learning experience. The presentation will look at both the challenges and benefits of moving collaboration and communication outside the VLE and present staff and student feedback on their experiences of using Teams as opposed to other more traditional VLE-based tools and the provision of a safe collaborative space.

**Keywords:** online discussions, distance learning, microsoft teams, digital competence, directed diffusion of innovation, online collaboration tools, digital capabilities, transactional distance, discussion boards

### 1. Introduction

Based in the north of England, Leeds Beckett University (LBU) has over 24,000 students, most of whom are undergraduates taught on campus. Postgraduate provision shows a growing number of distance learning students. As part of its education strategy, LBU is considering offering students on undergraduate courses the choice to do one or more modules via distance mode, with the hope that, if properly implemented, the flexibility afforded will encourage better engagement. LBU has thirteen academic Schools and Departments and is supported by professional services, for example Information and Technology Services (ITS), Libraries and Learning Innovation (LLI), the Centre for Learning and Teaching (CLT), and the Distance Learning Unit (DLU).

Arguably, decisions relating to any digital technology adopted by a university impact the student's experience and related learning. Any major, department-spanning project, such as the introduction of new software,

means choreographing the different timescales, technical and communicative competences, and professional cultures of different departments, even if they operate within central governance structures. The evolving regime of external regulation has both direct and indirect impacts on university life. The General Data Protection Regulation (GDPR), in principle not relevant to an education strategy, has implications for how the university deals with student records, and hence the student relationship. Regulatory initiatives such as the Teaching Excellence Framework generate their own data requirements, measuring existing realities or creating new categories for measurement. This environment is not unique to LBU but suggests that the tools and affordances of learning technologies occupy just one corner of a digital and material ecosystem of projects, programmes, platforms, and devices, which compete for students and academics' time and attention, and for scarce organisational resources. Entangled with these, on a spectrum from users to managers, are different groups, with their own professional cultures, specialist languages, and working practices.

### 1.1 Software 'tools': problematising the concept

This paper reflects on a pilot for the introduction of MS Teams at LBU. The first reflection, however, is theoretical. We can problematise the default metaphor of software platforms and devices as 'tools'. For example, Major et al (2018, p.2015) state that 'students' learning is tool dependent' and call for 'further and continuing investigation into the nature of the interactional conditions under which new tools become productive for learning'. However, Gourlay (2015) has asserted that whilst learning in a university is a set of complex set of socially situated practices, the underlying metaphor that devices and software are merely 'tools', suggests they are inert until activated and this underplays their role. Drawing on the social theorist Bruno Latour (2005) Gourlay suggests these devices are 'mediators', actively shaping the learning. The operating needs of the devices, software, and platforms make us entangled with them. Lest the potential agency of these 'tools' appear fanciful, behind platforms such as Facebook, which seem designed to maximise users' attention and participation in text making (Seymour, 2019), lie the algorithms and hidden content curators that constitute the distributed agency and data-extractive business model of one of the world's largest companies.

### 2.1 Introducing new 'tools' – some general remarks

The introduction of new general-purpose software tools spanning professional services, academics, and students, must take cognisance of the different structures, user timescales, user competences and cognitive load involved in using them and being entangled with them. Introducing a 'tool' inevitably involves more than just a 'device', or a procedure: what is introduced is a device or software plus user behavioural practices in a set of 'contexts'. Reflecting upon the experience of LBU's DLU, these contexts might be as follows. (This is not the product of a targeted research programme).

The first context consists of the rules, practices, and aesthetics of the discipline or community of practice in which the 'tool' is expected to live. A 'tool' contains 'rules' for basic use, but once adopted in a disciplinary or work setting there will be a set of expectations as to how it will be used and what outputs it offers. For example, one of the authors has delivered PowerPoints in the contexts of business consulting, heavy in data visualisation, and textual prompts, and elsewhere in Humanities research conferences. The aesthetic and communicative conventions were quite different.

Secondly, we must consider user competence in the context of situated practices. The nature of these general-purpose 'tools' is of the 'take it or leave it' variety, with sophisticated features available to those that want them. Spreadsheets, a well-established technology, are used in many ways and with many different levels of skill. If we can compare working in Excel to speaking a language, it is obvious that people get by with varying

degrees of fluency. Thinking about learning and teaching, we can distinguish perhaps between 'technical competence', understanding how it works and what it can do ('I can do pivot tables'), with 'pedagogic competence', the ability perhaps to imagine what situated educational practices the technology can enable ('I can see how pivot tables work but have no idea how to create one, but I can see how they might be used in class'). A typical Virtual Learning Environment (VLE) requires basic technical competences required to use it as a simple repository and announcement system, but more pedagogical sophistication if this is the students' primary engagement with the course – the latter being the case for LBU's distance learning students. Let's apply this to social media: platforms such as Facebook are easy to use, do not require any particular level of competence to navigate and provide some powerful communicative affordances. Yet, Iredale et al's literature review of social media use in teacher education cautioned 'against the assumption that students were able to apply critical thinking' being in our view a cardinal academic virtue 'in these spaces without careful guidance'. The technical and pedagogical come together in 'digital competence', the confidence to apply digital tools through a clear understanding of the pedagogic potential. Incorporating and using digital 'tools' in programmes requires understanding of the tool, the pedagogy behind using a particular tool, and the differences of between one tool and other. To be digitally competent requires user clarity about what is required from the tool and the course design. Users differ in their different digital competences, but professional development opportunities exist, with the aims of raising the competences of digital practitioners and meeting regulatory guidelines and protocols. Such digital development programmes can be industry-led: Microsoft's Education Centre offers a portfolio of short courses (such as Innovation Expert) applying Microsoft tools to case study exemplars. Some universities might also develop their own training.

Third, there is perhaps what we might call the context of user 'affordance desire': a tool's affordances may be inadequate to, or might impede, the achievement of the pedagogic goal, however clearly understood this goal might be. A motivation for the MS Teams pilot discussed below was dissatisfaction, expressed by both academics and students, with discussion boards within the LBU's VLE, described as confusing and awkward in terms of navigation and use. In other words, the desire for affordances was frustrated. Furthermore, Moreover, perhaps students communicate outside these mandated spaces, for example on social media as opposed to the VLE, because their communications flow naturally into these easier channels.

A fourth context might be called the user time/affordance calculus. There are many calls on academic and student time and cognitive resources. They must see the benefit of the tools, be able to visualise them operating in situated learning practices, and have sufficient cognitive space and time to master them to a sufficient level of digital competence (technical and pedagogic). This is more challenging than meets the eye. Firstly, there are significant sunk costs of learning things, in time and effort. Is it worth incurring these again, with a new tool, and the practices around them, for marginal or uncertain benefits? Network effects, in which the benefit of a tool arise from other users, also make a difference. There might be good, objective 'reasons' to convince people to move to a new tool, but people need to be motivated to make the effort given the many other calls on their attention. Thus, a 'satisficing' solution may be preferable, for pragmatic reasons, to an 'optimising' one. The calculus will adjust if there is institutional support to share the load, or training to reduce learning costs, or standardised templates to avoid wheel-reinvention. This consideration might also refer to students who might also take an optimising or transactional approach as to what 'works' for them.

Fifth is the issue of mission criticality. At the level of the institution, a functioning student record system is mission-critical, and how it is used cannot really be a matter of personal discretion. 'Mission criticality' does not exist just at an institutional level; it can also exist at a course level. Certain things must happen – assessments submitted, for example – for the student to succeed.

Sixth is the context of organisational management, culture and resourcing. One of the authors of this paper has worked in both Higher Education (HE) and Further Education (FE) institutions (both in the UK). In her experience, the HE environment offers more flexibility in the use of digital technology as part of the curriculum design than is the case in FE. This may reflect external factors in how these organisations are governed and funded. For example, in FE, there is a requirement to meet the standards of OfSTED (Office for Standards in Education, Children's Services and Skills). A national body, the Joint Information System Committee (JISC) has made several proposals to implement the Further Education Learning Technology Action Group (FELTAG) agenda, suggesting the use digital technology in Further Education to improve the learner experience (JISC, 2016, online), an aim to include at least 10% of online learning in every public-funded learning course from 2015/16; and an aim to increase online learning within these programmes to 50% by 2017/2018 (FELTAG report, 2012, p.23). Targets like this come with risks. Whilst evidence suggests an increase in online teaching and learning going back several years (Bonk & Zhang, 2006; Er, Özden, & Arifoglu, 2009; Skylar, 2009), the initial response was often to recreate traditional teaching methods in the online environment (Shi & Marrow, 2006). Simply replicating the teaching materials to an online environment does not make it a fully functioning online course. In the author's own experience, the combined pressures of the above meant that digital tools were used inappropriately or not to their full potential. They were introduced without consideration of people's existing digital competence. Some tools were implemented to 'tick a box' to meet online learning requirements and often tools were used without formal training.

Seventh, we can perhaps suggest the context of team culture and competence. The focus above has been on individual digital competences of academics and students, but the phrase 'course team' shows this is a collective endeavour, and variable levels of digital competences can affect the student experience. But there is also the team's culture to be considered. The DLU struck by the contrast between two course teams when introduced to Ms Teams: one team, law, were offered the team it and immediately started communicating with it; the other team, International Relations, requested a more formal briefing session.

### **3.1 Tool use and the context of transactional distance**

However, looking at learner-learner, learner-content and learner-tutor interactions is the impact of a tool on transactional distance, which has been theorised by Moore (1989). Transactional distance is present when both the learners and instructors are separated by space and/or by time: "distance education is not simply a geographic separation of learners and teachers, but, more importantly, is a pedagogical concept" (1997, p.22]. It focuses on the interaction between the learner and instructor based on the structure of the programme, dialogue, and learner autonomy, and how these can increase or reduce the transactional distance. If, say, MS Teams offers, as an affordance, an easier way for learners to connect, it has the potential to reduce transactional distance; and if they do in fact connect more, this potential has been realised. This platform reduces transactional distance and thus perhaps changes the relationships students enter into. Moore discussed three key components of the theory: programme structure, learner's autonomy and instructional dialogue (communication). It shows how transactional distance occurs and the correlation between the key elements (for example that dialogue and structure are interconnected). Falloon (2011, p189-190) has characterised the components as: the 'structure' of a course, its rigidity or flexibility as shown in the curriculum planning and consideration of assessments and the ability to accommodate individual student needs. Learner autonomy is referred to as the student's own sense of self-direction or determination. Dialogue is referred to more than communication alone but also takes into account different types of interaction. Moore's three types of interaction (Moore, 1989, cited in So and Brush, 2008) focuses on the interaction between (a) learner-content interaction, (b) learner-instructor interaction, and (c) learner-learner interaction.



In our view, a potential for a reduction in transactional distance is the result of some of the affordances offered by MS Teams, for example online collaboration and discussions. For example, as it is easier to use and flexible enough to support dialogue, offering a bilateral communication between the learner-instructor or learner-content, thus minimising transactional distance. This could also be related to the features in MS Teams which permit instant feedback, for example, polling responses. Feedback could also be gained by comments from peers and tutors through instant messaging or private chat function, and one feature within MS Teams that allows the learner to directly notify the group or an individual is by the @mention function. This suggests the transactional distance is reduced between learner-learner and learner-instructor interaction as the notion of using the feature is to gain an immediate response. Other communication features such as instant messaging and emojis/animated GIFs/stickers are present to support interaction learner-learner interaction and learner-instructor interaction, enabling a calibrated support to learners on different places on the spectrum between autonomy and dependency. A more autonomous learner may not need constant dialogue, if the structure of and navigation around the dialogue space is well designed. Some of the features of MS Teams, including conversation search, notification settings, real-time chat history, ability to follow channels (at the choice of the learner) are useful for personalising the student learning experience where there are different options to structure how they interact with the content e.g. do they want immediate notifications? To bookmark a message for later? To search for a particular topic and comment later? MS Teams allows learners to pace the information available to them. Importantly, users do not need to be logged into the platform, as notifications can be sent to email accounts.

One example of how the design of MS Teams enables a reduction in the transactional distance for all interactions is the use of instant messaging. The instant messaging feature supports multiple formats of communication, including voice/video conferencing, sharing of weblinks, comments, and emojis/animated GIFs/stickers. Furthermore, MS Teams has the functionality to store files to link accordingly (e.g. collaboration on SharePoint file) and customising tabs e.g. present the relevant weblinks as tabs on channels for easy access. By setting up MS Teams appropriately using instructional design techniques, the learner-content interaction flows and the content design are easier to navigate.

#### 4.1 Collaboration tools

It is worth reflecting on the affordances offered by the use of collaboration and social media software in higher education. Firstly, approaches to pedagogy that are built on social learning theory would possibly lead to the belief that 'collaboration' in the online space is an instantiation of social learning, and the online collaboration space is thus the site for such learning to take place and relevant textual content to be created. Indeed, some DL courses at LBU have, for many years at PG level, used wikis in assessments. The distance learning Postgraduate Certificate in Education based on the idea that 'community is the curriculum'. Of course, this assumption might well be contested: it is not necessarily the case that students, for example, welcome collaborative assessments, or even collaborative working, if this is seen as leading to unfair work-sharing, free-riders; or there may be issues of social etiquette in 'critique-ing' fellow students' work. So, even treating collaboration software merely a 'tool' (with attendant situated practices) needs to be nuanced. What pedagogical and technical competences do academics have? What affordances are desired by academics, in terms of how they want students to perform, as students, and students and are these compatible? How do students engage in the spaces created? If we consider platforms as providing spaces, what are their boundaries? Iredale et al refer to the lack of appreciation of the social/professional divide in student/academic use of social media; familiar online spaces were not seen as 'academic' in the same way as institutional ones; that there may be different norms for social presence in each space.

As well the hoped-for pedagogical benefits, there is an aspiration that the use of social media and collaboration might respond to online students' expressed desire for student community (Hewson, 2018). Student 'Facebook' communities might provide a sense of belonging, but if these are entirely self-selected, they might marginalise those not 'invited' to join, highlighting divisions rather than erasing them. However, if social media are used for educational purposes, and in some way are official, Universities cannot avoid their responsibilities over equality and inclusiveness, and the legal and ethical concerns over the extent to which learning content and students' personal journeys can be mined for data for social media companies. Universities have data collection needs: recorded engagement with digital systems and content can be used as evidence of 'participation' which might involve learning, or a performance of behaviours taken as a proxy for it (Gourlay, 2015 [2]).

Finally, it might be supposed that collaboration is expected in workplaces and so, therefore, common sense would suggest embedding this in courses. This again requires nuance on the understanding that collaboration 'for work' may be very different from collaboration for academic practice. Microsoft (2018) claims that business usage of MS Teams has doubled in two years, that real-time 'chat' applications are expanding as they offer functionality that email cannot, and that larger business are adopting it more quickly than smaller business. Anecdotally, at recent validation events for LBU distance learning courses, external members have welcomed the use of MS Teams as it is either used in the workplace or other tools like it such as Slack. Whilst course collaboration might not inevitably translate into workplace norms and hierarchies, there is an implicit 'employability' benefit.

Following from above were two implications for our MS Teams pilot. Firstly the use of collaborative and community-building software needs to occupy a space between the inadequate 'discussion board' offered by VLEs and the unstructured free-for-all of social media so that students are not forced into clunky discussion boards, on the one hand, or forced to use 'their own' spaces for 'governed' academic purposes. One can almost envisage it as a multipurpose space such as a 'park' with different areas operating under differing rules. Secondly, given the enormous flexibility of the MS Teams, and its general-purpose nature there needed to be governance regime over its adoption.

### 5.1 Piloting MS Teams

The type of innovation and implementation strategy adopted for MS Teams has been influenced by the factors above. What follows results from these deliberations. A new student record system such as Banner, is specialised and mission-critical. As such it needs a fully planned, institution-wide effort to change things over, and an established standardised level of understanding and competence depending on the roles of people using it. This is a centrally directed project. This might be contrasted with the rapid adoption of social media platforms, such as Facebook or LinkedIn, by students and academics, outside the perimeters of the University's systems. The growth of usage, in this case, might perhaps be modelled via a diffusion of innovation approach, with take-up growing as a result of marketing, ease of use and network effects (the more people on it, the more useful it is). In other cases, where software is not mission-critical at institutional level, but potentially beneficial at course level, the key is to get people to adopt them if the user affordance calculus can be managed in the right way or if there is sufficient user affordance desire to make the effort. One might, therefore, hazard a suggestion that different institutional strategies are therefore needed to ensure the adoption of a 'tool' such as MS Teams by assessing how MS Teams can be calibrated against the above.

At LBU, the introduction of non-compulsory collaboration software, MS Teams, by distance learning courses has fallen somewhere between the requirements of 'central direction' like a new student record system, or

something that can be simply 'made available', by a pure diffusion of innovation approach in which the entire functionality is offered, unmediated, to academics with the injunction to 'be creative'. Perhaps we can coin the phrase 'directed diffusion of innovation', more nuanced than 'phased rollout' (which still implies institution-wide agency from the centre) to describe our approach to MS Teams. Whilst not mission-critical for the institution, it has proved desirable for some courses, and, indeed, mission-critical for other courses. The 'burning platform' stimulating the move was the end of Google's support for its communities platform and the move to office 365 for all students. Unmet affordance desire was the expressed dissatisfaction with the VLE collaboration platform. It is viewed also as potentially satisfying the affordance desire surrounding some aspects of student engagement. This led the user time/affordance calculus to change.

### 6.1 The MS Teams project

MS Teams was first offered to LBU as part of the rollout of office 365, which included Skype for Business, which MS Teams may eventually replace. Unlike the VLE, which in Leeds Beckett is 'owned' by Libraries and Learning Innovation (LLI), MS Teams is 'owned' by Information and Technology Services (ITS), a different set of stakeholders to work with. ITS had managed major projects such as the Banner upgrade and the rollout of Skype for Business and office 365 to staff and students, major institution-wide projects, for comprehensive adoption.

The MS Teams project was part of a roll-out of Office365 to all staff and all students. The advertised attractions of MS Teams in terms of benefits to staff were its role as an additional communications channel, its potential role as a community-building device in course cohorts, a reduction in email traffic, a private network enabling GDPR compliance, the ability to work synchronously and asynchronously, collaborating in real-time, and use as discussion. Benefits to students were advertised as the digital capabilities potential for course collaboration, the potential for employer focus, better communications with other students, and device neutrality offering mobile and desktop access. Features of MS Teams allow it to be used as a synchronous tool, an attribute that is well documented to enhance participation in DL courses (Hrastinski, 2008). Teams had already come with certain templates (e.g. Classes) built-in, but its use in a course might be: as a collaborative online educational forum for students to contribute and participate in module discussions; as an online social space allowing for 'safe' discussion; as a repository and file exchange platform that allows students to share and collaborate on course documents and resources.

Rather than just 'switch it on' the implications of a free for all in terms of student experience and IT administration were such that a pilot approach was needed, and the chance to pilot was offered to a mix of courses and services. Across LBU, there were 30 pilot projects running in the academic year 2018-19. The main objective of using Teams varied between the pilots, with the breakdown as follows: seventeen Team sites supporting activity within professional service departments (8) or collaborative activity across more than one department (9); seven MS Team sites supporting academic staff groups to aid course coordination or academic leadership; six MS Teams sites including students. These team sites support academic delivery, typically focused upon use of the discussion board function to aid collaborative work and peer to peer support.

DLU volunteered because, as a small but technologically aware department, DLU is used to piloting new things, and being digitally competent. Therefore, as first-line users, we could see how it would work in a department. DLU was also a 'channel' through which the innovation would 'diffuse' in a directed way to the course teams with whom DLU is a trusted partner (a claim validated by internal surveys), as DLU's Academic Instructional Designers combined, in their roles and expertise, both pedagogical and technical competences. Therefore, DLU

was a useful mediator not only in providing a communications channel through which this technology could be disseminated to DL courses, shaping the adoption of this technology in distance learning course teams.

### 7.1 Departmental adoption of MS Teams

The DLU is relatively small department of thirteen people, but occupying adjacent physical spaces. The team deals with many different projects. Some team members work from home for a certain number of days a week and are at times physically present elsewhere in the University with clients. However, they are not a virtual service or outworkers. The view of DLU management is that 'sharing' different experiences of course teams and innovation are crucial to its effectiveness and that close personal interaction would be facilitated by contiguous physical spaces where everyone has a geographical home. DLU had used a Google Community but had concerns with its user-friendliness as well as the inconvenience of multiple sign-ins and so on. When DLU looked at MS Teams, the main attractions were the existence of channels for different subjects and conversations, the ease of adding files and links, the existence of private and group chat, and the familiar social interface were the main attractions. Furthermore, email notifications made it easier to carry on with other work, out of the Teams environment, but still linked to it. Since that time, other features have been added, such as video conferencing. Within DLU, there were many different types of existing conversation in the team, a mix of places where data was stored, whether related to projects or administration and only the occasional use of communities to start discussions.

MS Teams is 'general purpose' in that many things can be done with it, and it can be set up in different ways. The DLU's MS Teams implementation was integrated into our methods of collaborative working, information sharing, and daily communications, in effect becoming an additional virtual space, complementing our physical spaces for communication and collaboration and, eventually, replacing the virtual spaces where data is stored. It is perhaps an extra 'room' in our office set up.

Channels (the name in Teams) were built around our core areas of work and most frequent areas of communication including: specialist uses such as technical troubleshooting (where team members ask each other for advice); temporary channels for projects (such as migration to SharePoint); a channel for strategic themes, such as Academic Digital capability; channels to post or ask feedback on or research interests of team members (e.g. virtual and mixed reality, eLearning tools etc.) to enable sharing of outputs, and gathering of comments; pressing forward the 'environmental agenda'. A 'general' channel was set for departmental announcements or requests. A 'DLU Chat' channel was set up explicitly to provide an easily accessible space for informal communications for example photographs of weddings, pets (cats, especially), and children, the reliability of local rail operators, the relative merits of local fast food outlets and so on. 'Contentious' subjects have not been posted. Within DLU the notion of transactional distance does not arise. However, DL team members are now entangled in MS Teams implementation, and the work of the department is textualized, visible and collective in a way it was not before.

DLU members engaged well. One member said it had 'created a more community feel...rather than constant email...keeping up to date with other people's projects...share information easily'. Other comments referred to the value of its use on multiple devices, seeing older conversations, and the social-media style 'like' options and related emojis which provide instant feedback hit. Even in a small department, with people working often in close physical proximity at least some of the time, team members have identified clear benefits in terms of information sharing, collaborative working and file storage, and community. Such clear 'pragmatic' functional benefits, deriving from a better user time/affordance calculus were clear, simply as it made far more convenient and 'natural' those processes and digital communications that were clunky or too much hassle to

manage. Less certain is whether MS Teams has simply satisfied existing unmet needs, or whether it has created new opportunities for sociability and collaboration that had not been envisaged before. As well as a more effective communication tool, MS Teams textualises, and hence makes a visible record to management of the social and intellectual life of the office, otherwise be less accessible or indeed ephemeral. It is not clear whether this traffic has simply moved from using emails into a more appropriate space. This visibility might be a good or bad thing, depending on indeed management culture and practice.

Other considerations arise if apply Tuckman's [1965] model, which offers four stages in team development: forming, norming, storming and performing. DLU as a team already in the 'performing' stage and used to working as a team, owing to co-location and the culture of knowledge and expertise sharing. Culturally and managerially MS Teams was seen as a good fit. An example of MS Teams in the 'forming' and 'norming' stages is in LBU's Advisory Network for IT projects, to collect stakeholder input on IT initiatives. This governed space, standardised documentation, and strict archive practice, is for people who are not a work team but have to communicate occasionally.

Other considerations apply when MS Teams as a device for courses where students and tutors come together for the first time. A cohort of students working on a course is not a 'work team' as one might understand it. DLU's second engagement has been pilots' pilot was the involvement of DLU in applying MS Teams to a module on a number of courses. In one course, it was offered to a team which had already made use of Slack: not surprisingly, the course team did not wish to change over as the user time/affordance calculus did not make it worthwhile. The DLU's second pilot was with the MSc Psychology (top-up) a long-established course, staff experienced in online delivery, high satisfaction ratings in the Postgraduate Taught Experience Survey. The course team agreed to choose one module, 'Working and Living in a Social World'. There were 67 students and two academics on the course. DLU's aspirations, based on working with this at a departmental level, were that MS Teams would satisfy multiple affordance desires: it would improve engagement, develop an active learner community, facilitate collaborative working and resource sharing. This is because it provided a secure professional network but was also accessible with a good mobile learning experience that provided a synchronous feel to asynchronous communication, enabled a focus on collaborative learning and gave students more control. (As mentioned above, synchronous learning can improve participation.)

The experiment was a very simple one, which allowed a clear comparison between the course with MS Teams and without MS Teams, without radical changes acting as noise which would filter out. DLU and the course team removed from the VLE all existing discussion board activities and Topic Questions and Answers, replacing them with MS Teams, thus providing a 'like for like' comparison with the two experiences. There was clear signposting in the VLE, and students were told that they were part of a pilot. It was explained to them that, whilst Teams has a social media 'feel', it was more secure. The pilot set up also involved creating channels, amending the VLE, populating the channels, and providing a secure way into Teams for students. The DLU's perspective, as online learning specialists were largely positive. Manual enrolment was time-consuming but will be automated, and work needs to be done to integrate Teams in the VLE and registry systems. DLU also noted a need for being discipline around the academic practices of releasing content, enrolment, and announcements.

Students on this module had already experienced the VLE, and there were measurable and suggestive changes in their behaviour. 16% more posted to Teams than the previous year, with nearly two-thirds saying they were more likely to contribute to a discussion in MS Teams than in the VLE. They particularly liked the social media feel, but also basic features such as email notifications seamlessly appearing in office 365 made it more user-

friendly, without total immersion in the sight. 91% also wanted it used on other modules. The experience of academic staff was also changed. There was only one student query by email in ten weeks, showing the extent of migration to the new platform, as this appeared in MS Teams. Academic colleagues reported the MS Teams felt more 'conversational' and generated more 'discussion' than normal 'discussion boards'. It is quite possible that MS Teams draws on skills people have developed by working with social media, and so existing norms and social practices shaped this engagement albeit in a 'professional environment'; it is possible that the type of 'conversation' between 'learners and learners and 'learners and tutors' may differ from more directed or limited encounters in a discussion board. It is more than a replication of a virtual conversation though – everything is recorded, and it is not yet clear how far students go back, what additional use they make of the conversations, and so on. All of these are fruitful subjects for later research. Of course, it was important to set expectations – instant feedback and response are not possible, whereas this might be expected by the way some platforms work. This suggests developing the right sort of practice around the tool is a social process as much as a technical one.

In a module for Law, MS Teams were activated prior to student enrolment to allow staff an opportunity to test the tool. There was no formal training offered to the staff prior to their access to the tool. To our surprise, expecting hesitancy and resistance, within the first day, the course leader and all confirmed module leaders contributed and posted on MS Teams. Most shared entries not only in the welcome activity but also more informal introductions (often involving photos of pets) in the 'Social Chat' area. Following enrolment, students have also posted and shared their circumstances about what brought them to study Law. These contributions help staff understand how Distance Learning students differ from the classroom students and offer a far richer relationship between academic and student. Through positive interactions on MS Teams, the transactional distance was reduced through asynchronous dialogue that mimics synchronous conversations.

There were some cases where the implementation did not work successfully. In another pilot where a network group of academic advisors (led by student services and academics), piloted MS Teams as a tool to encourage peer to peer support. The conclusion from the academics involved in this pilot preferred using the VLE as a student hub and thought their use of MS Teams duplicated the announcement function. There was an assumption that, because students are familiar with the use of social media technology, they would be comfortable to use MS Teams. It became apparent towards the end of the pilot, that the expectation of the student role was not clearly established, and the engagement between peers was not fostered. Academics were more familiar with the VLE and thought MS Teams was a duplication of the notice board.

## **2. Conclusions**

DLU's view is that MS Teams chances of a successful implementation will be higher if there are some key principles adhered to, and these involve attention to the social and teaching practices in which the 'tool' is used. As with any software implementation, we need to consider the rules, practices and aesthetics of the discipline; user digital competence in the context of learning practices; mission criticality; user affordance desire and user time/affordance calculus. These factors will express themselves in very variegated ways in different course teams or departments. Hence a directed diffusion of innovation approach, based on digital competence, was the mode chosen for LBU. Moreover, there will be an interplay between the existing culture and communication practices of an existing Team that adopts MS Team, and the affordances MS Team offers. It is suggestive that features of teams, such as blending both synchronous and asynchronous, and its use on multiple devices, incorporation in emails, might reduce perceived transactional distance. Although the work



of community building is social, the MS Teams technology, can, depending on one's choice of metaphor, act a prosthesis, supercharging social effort, or provide a conveniently safe, and comfortable space where communication flows can naturally occur without being directed outside. Although MS Teams supports learning community, a social channel, as in DLU, can foster engagement. It is almost certainly not the case that student groups will migrate their social interactions – as students - into such a space but is possible that the more informal aspects of learner-learner interaction (as learners) might migrate into this more secure, private space, integrated with other academic systems. Of course, there are other technical issues to manage, for example, retention and archiving policies (for record-keeping, GDPR), naming conventions, who and how individual MS Teams are created. MS Teams might not, of course, be the optimal approach to all courses, depending on the learning needed, the type of learning community created, and user competence.

### 8.1 Further practice and further research

The first strand of further work is implementation of MS Teams on more courses, as a matter of necessity, for example, LBU's distance learning Post Graduate Certificate in Education, which already uses a 'community of learners' as part of its curriculum. This is a very different proposition than postgraduate distance learning. The second strand is a more formal research project to be conducted by LBU's Carnegie School of Education and LBU's School of Events, Tourism and Hospitality. This will be a formal 'mixed-methods' study following the lived experience of forty distance learners from three postgraduate courses and their uses of teams. The study will seek to identify the impact of a 'less formal' collaborative digital technology for use in taught course modules and the legacy it has for both peer-to-peer and student-staff engagement and collaboration. The role of the teacher will also be explored and the implication for teaching and learning in this new-age learning environment. MS Teams will be embedded in the three postgraduate courses involved in the research. The advantage of this approach is that three different postgraduate courses offer a diversity of students and a mix of disciplines and assessments. This might show how MS Teams is better suited to some courses than others, or if external conditions influence its effectiveness.

## 3. References

- Bonk, C., & Zhang, K. (2006). 'Introducing the R2D2 model: Online learning for the diverse learners of this world'. *Distance Education*, 27(2), pp. 249-264.
- Er, E., Özden, M., & Arifoglu, A. (2009). 'A blended e-learning environment: A model proposition for integration of asynchronous and synchronous e-learning'. *International Journal of Learning*, 16(2), pp. 449-460.
- Falloon, G. (2011) 'Making the Connection: Moore's Theory of Transactional Distance and its Relevance to the Use of a Virtual Classroom in Postgraduate Online Teacher Education'. *Journal of Research on Technology in Education*. Vol.43(3), pp.187-209
- Gourlay, L. (2015)[1] 'Posthuman texts: Nonhuman Actors and the Digital University.' *Social Semiotics*, 2015 vol 25 no 4, 484-500 doi.org/10.1080/10350330.2015.1059578
- Gourlay, L (2015)[2] "'Student engagement" and the tyranny of participation.' *Teaching in Higher Education* March (2015) 20(4):1-10 DOI: 10.1080/13562517.2015.1020784
- Hrastinski, S. (2008) 'The potential of synchronous communication to enhance participation in online discussions: A case study of two e-learning courses.' *Information & Management*, 45(7), pp.499–506.

- Iredale, A., Stapleford, K., Tremayne, D., Farrell, L., Holbrey, C., Sheridan-Ross, J. (2019) 'A Review and Synthesis of the use of social media in initial teacher education'- Unpublished paper in progress
- Latour, B. (2005) *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: OUP
- Major, L., Warwick, P., Rasmussen, I., Ludvigsen, S and Cook, V (2018) 'Classroom dialogue and digital technologies: A scoping review.' *Education and Information Technologies*, 23(5), pp.1995-2028.
- Marthaler, J. (2011) *Theory of Transactional Distance* (Online). Available: <https://sites.google.com/a/nau.edu/learning-theories-etc547-spring2011/theory/theory-of-transactional-distance>
- Moore, M. G. (1997). "Theory of transactional distance." In Keegan, D., ed. "Theoretical Principles of Distance Education, Routledge, pp. 22-38. Available online: <http://www.c3l.uni-oldenburg.de/cde/found/moore93.pdf>
- Moore, M. G. (1989). 'Editorial: Three types of interaction'. *American Journal of Distance Education*, Vol.3(2) pp.1-7.
- Microsoft News Centre UK (2018) 'Number of companies using Microsoft Teams 'to double within two years' <https://news.microsoft.com/en-gb/2018/12/12/number-of-companies-using-microsoft-teams-to-double-within-two-years/> [Accessed 20 August 2019]
- Seymour, R. (2019) *The Twittering Machine*. London: Indigo
- Shi, S., & Morrow, B., V. (2006). 'E-Conferencing for instruction: What works?' *EDUCAUSE Quarterly*, (Vol.29(4), pp.42-49.
- Skylar, A. (2009). 'A Comparison of asynchronous online text-based lectures and synchronous interactive web conferencing lectures'. *Issues In Teacher Education*, 18(2), pp. 69-84.
- So, H-J., and Brush, Ts. (2008). 'Student perceptions of collaborative learning, social presence and satisfaction in a blended learning environment: Relationships and critical factors'. *Computers & Education*. Vol.51. pp.318-336
- Tuckman, N. (1965) 'Developmental sequence in small groups'. *Psychological Bulletin*. 63 (6): 384-99. doi:10.1037/h0022100.

## Blended learning in industrial design

### Iris A. Domínguez

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
ibidominguez@guadalajara.uned.es

### María del Mar Espinosa

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
mespinosa@ind.uned.es

### Luis Romero

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
lromero@ind.uned.es

### Manuel Domínguez

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
mdominguez@ind.uned.es

### Abstract

The acquisition of knowledge, abilities and skills implies, on the single hand, the assimilation of a serial publication of theoretical content. Only when the subject matter is eminently pragmatic and creative, as is the shell with industrial design, most of the learning effort must be done with practice, either through exercises of increasing complexity or through methodology project-based or, as in this instance, by a combination of the two methodologies.

This article presents the results obtained after several years of blended learning in industrial design at the Spanish University of Distance Education – UNED. In this arena, the attainment of theoretical contents is combined with the recognition of practical usages, some took out by the students at home, and others carried out in the research labs of the Higher Technical School of Industrial Engineers of the UNED, where students possess the opportunity to physically handle the almost avant-garden design tools, such as three-dimensional scanning systems, the modelling and sculpting aided design systems, or 3D printing systems.

**Keywords:** Blended learning, Industrial design, Knowledge acquisition, Distance education, 3D scanning, modelling aided design, 3D printing.

### 1. Introduction

In the field of university education, and in particular in the field of engineering, technological innovation and innovation in educational aspects must be the fundamental guideline of work (Vallecillo et al., 2018b)(Martín-Erro, Espinosa, & Domínguez, 2018). In particular, in design, it is very important to work on creativity (Martin-Erro, Espinosa, & Domínguez, 2015).

There are subjects, such as history, where the main thing is data sequencing and more or less memoristic learning of the contents. Design is a diametrically different matter. The contents to be learned in this matter are relatively few. Technical drawing is important as a communication tool for design. A minimum of training in aesthetic contents is important, but

the most important thing is to learn how to solve design problems, that is, to solve through mechanisms and systems, ingenuity, needs that have previously been located in the environment (Iserte, Espinosa, & Domínguez, 2012).

This implies learning to resolve problems that are not quantified, that is, they are not previously solved problems for which a protocol has already been made; new problems must be learned to solve, with different challenges and troubles that have not previously been answered in the same conditions.

In artistic settings, the artist is born, but also formed; and is formed by exercising at. The painter or draftsman must spoil many papers and canvases before achieving a valuable painting or drawing. The same thing happens in the field of design. It is said in academic, technical drawing environments that "to draw is learned by drawing". Easily, with the same parameters, it can be said that "to design one learns by designing". The best way to learn how to solve problems is to solve them (Vallecillo et al., 2018a).

From a formative point of view, it is interesting to take into account the approaches made by Prádanos in terms of interactive technical drawing practices (Prádanos et al., 2009). In these practices, it is necessary, as far as possible, to approach the protocols and forms of work that the student will have later in his professional life. It is therefore important for students to operate professional assisted design systems as well as state-of-the-art 3D scanning or 3D printing machines (Cañedo-Argüelles & Domínguez, 1999) (Romero, Domínguez, Espinosa, Domínguez, & Jiménez, s. f.).

This paper presents the results of several years of teaching in the field of industrial design, taught at a school of industrial engineers. It is provided in the first place, since it is a distance learning school, a macroscopic vision of what our university is. Below is an exhibition of the contents of the subject, its structure and organization. As indicated above, this subject is taught using the blended learning methodology, that is, there is a part that is developed through the Internet, where there are both content and exercises that are carried out remotely; and there is another part that is done in person, where a project is developed that begins and ends in the eight hours that this session lasts.

## 2. Reference frame of our distance university

A face-to-face university is headquartered in one location and sometimes has a location in three or four other locations. A university such as UNED is headquartered in more than seventy locations (figure 1) some of them outside the national territory.



Figure 1. Distribution of UNED Associated Centres worldwide (course 2018-19)

The profile of the students of the UNED differs in an important way regarding the profile of the students of the public universities, especially in three variables:

- Age: while at universities face-to-face only 15% of its graduates of master and degree have more than 30 years, at UNED this collective is 78%.
- Prior professional experience: a feature, closely linked to the previous one, is that a high percentage of the students of the UNED students already had extensive training and work experience on their backs: only 26% of the graduates were to start their qualifications looking to have their first work experiences, compared with 34% who were in an intermediate professional stage and 30% on a consolidated professional stage, with extensive professional experience.
- Motivations to carry out the degree: the motivations are quite varied. In particular, within the business motivations is largest to promote the profession to the get new or first work experiences. A significant number also seeks with his studies of the UNED reoriented her career towards a new profession.

Regarding the employment situation and the changes produced, we have the following information:

- Changes in the employment situation: Among those who did not work at the end of the degree, 56% were working two years later. Thus, of the total sample, 71% worked at the end, while at two years this percentage has risen to 81%. In addition to this positive data, the unemployment rate passed between these two moments from 16% to 11%, which represents a decrease of 31% in the percentage of unemployed.
- Changes perceived in the work: The graduates who kept their work between the end of the degree and two years later were asked about the changes perceived in the work in different issues. There were hardly changes to worse. Although a majority maintained the labour category and their wage and non-wage labour conditions, between 41% and 46% reported having improved in these three aspects. In addition, with regard to functions and tasks, the majority reported having undergone changes for the better (47%).

From all the above it follows that the UNED students have certain peculiarities in terms of age, work experience and motivations to study.

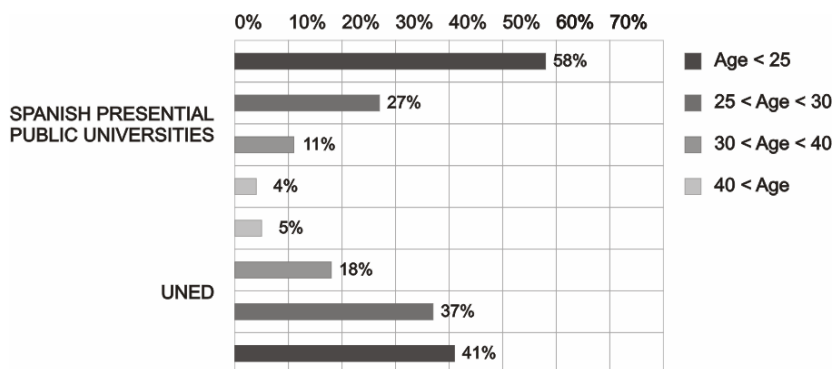


Figure 2. Distribution of graduates of the 2016/2017 course by age group

Figure 2 shows a comparison of the distribution by age of the graduates of master's and degree of the UNED and the rest of Spanish public universities, verifying enormous differences.

In public universities, 58% of the graduates are under 25 years old, while in the UNED the graduates of this age group only represent 5% of the total. On the contrary, in the UNED, graduates of 31 or more years are 78%, while in the rest of public universities they represent only 15.

These data show that the graduates of the UNED, with respect to the rest of the Spanish public university, are of much more advanced ages and, therefore, it would be expected that they have a greater previous experience, both work and training. This question is clearly seen in figure 3, which shows the professional stage in which the graduates were at the time of beginning their degree and master's degrees. Thus, only 26% were in an initial stage at work, looking for their first work experiences, compared to 34% who were in an intermediate stage and 30% in a consolidated stage of extensive experience. Likewise, there is also a relevant 8% of the graduates of the UNED who indicated that at the beginning of the degree they were looking to change their profession.

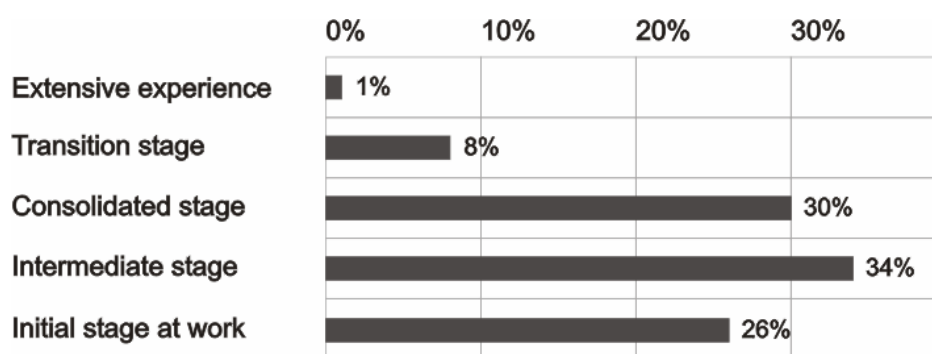


Figure 3. Professional stage before starting the degree

This aspect introduces us to the third differential dimension of the UNED with respect to what might be supposed of the face-to-face universities: the motivations to carry out the degree. Thus, if in the case of the young graduates of the face-to-face universities it is expected that it predominates as an interest to insert oneself for the first time in the labour world, in the case of the UNED the motivations are more complex and diverse, result of that student's profile with more established careers.

This we can verify in the figure 4, where besides the motivations extra-labour, such as personal development (marked by 60%) and vocation (38%), motivations such as academic promotion (28%) become important. But the highlight is that, within the motivations most strictly linked to improving the employment situation, the labour insertion is not the most important (selected by 25%), but vertical labour mobility (38%). Also, an important 21% indicated horizontal labour mobility as the main motivation. That is to say, 38% indicated that promotion in their profession was among their main motivations to do the degree, and a fifth indicated as motivation the change of profession.

In summary, with the data provided we can confirm that, among the students of the UNED, in addition to those who seek their first experiences there is an important number that seek either to change their profession or, above all, promote within their profession (Vallecillo et al., 2018b).

On the other hand, in recent years the demand for distance, blended learning and online education has grown significantly in Spain (Prádanos et al., 2009). However, despite the increase in demand for this type of study, the graduation rates of students in distance



education is significantly lower than those of face-to-face education, even in students who carry out their distance studies with dedication to full time.

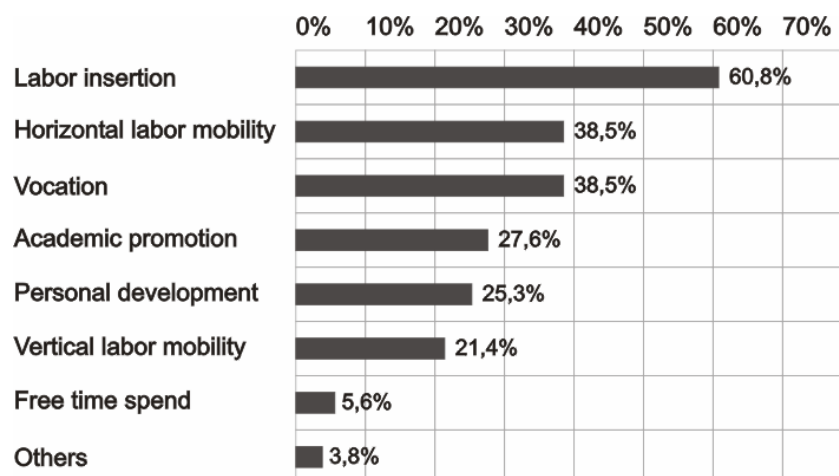


Figure 4. Motivations to carry out the degree

No doubt this situation occurs for a high rate of abandonment. Higher rates of abandonment not only should be of concern to the institutions which, like ours, are responsible for providing qualifications (Vallecillo et al., 2018b). The abandonment of studies may also have consequences of various kinds, namely:

- The economic consequences for the institutions that support distance universities financially and both State and regional Governments because of the relationship between unemployment and the low-skilled persons.
- Social impact, because higher education is an engine of economic growth in the territories, fundamental to promote the social and territorial cohesion.
- Personal implications, because the abandonment of studies can negatively influence the self-esteem of people and their employability.

In our case we have significant drop-out rates, and determining the causes of abandonment is a challenge that, although complex, must be addressed. Often, the abandonment has been attributed to factors such as the traditional profile of the distance student «an adult person of middle age that makes his studies compatible with family and work responsibilities and that, therefore, devotes a limited time to study» but more beyond this profile, which on the other hand is changing in recent times, the abandonment can be attributed to different types of causes:

- Administrative difficulties that have to do with the students access to the teaching and administrative organization of the institution.
- Cognitive difficulties, related with the processing of the information that is provided to the students, mainly through written and audio-visual, as well as the workload required by the different subjects.
- Affective-motivational difficulties, derived from the feeling of isolation experienced by students at a distance in relation to their institutions, their teachers and other students, which has been called "transactional distance" "distance deficit". These difficulties can be considered as challenges that our students face and for which the university can offer different types of support.

Therefore, the institutional response should be articulated around two axes: academic support (teaching, development of cognitive skills, evaluation and attention), and non-academic support, which is subdivided in turn in organizational support (advice to optimize the time of work and maintain the pace of the course, help to prioritize personal, professional and academic issues) and emotional support. The latter implies the development of motivation and the self-confidence of the students, as well as the management of stress, especially against the assessment. In this sense, as far as emotional support refers, there is no doubt that implementation of a system of mentoring and support students can give good results (M. M. Espinosa, Núñez, & Domínguez, 1999).

The abandonment occurs mainly in the first courses and in the early stages of the course, so it is essential to provide support from the beginning of the year, or even earlier. We estimate about 45% the defined rate of leaving early, in this case as students who fail to deliver any task, implying that the students remain in the institution about a month and a half. There is no doubt that any effort that is done to reduce these figures will have a positive impact on the academic activities of the University.

### **3. The subject Industrial Design**

The subject Industrial Design, of five ECTS, is an eminently practical subject, and therefore it is considered very important to carry out the exercises that are proposed throughout the course (Salido, Bernal, & Domínguez, 2002). It is very important that students master the basic concepts of industrial design, but it is also very important that they acquire skills in the use of computer tools (Vallecillo & Domínguez, 2018).

The main objective to achieve in the subject is that the future graduate, in his professional life, has a series of tools to enable it to develop in complex design and production environments where the factor of technical and human resources is always a key element (M. del M. Espinosa & Domínguez, 2003b).

The basic programme can be summarised in two teaching units, as follows:

- UD1. Product Design and Development
  - 1.1. Fundamental concepts
  - 1.2. Product life cycle
  - 1.3. Improvements to the design
  - 1.4. Traditional design, concurrent design
  - 1.5. Computer design and manufacturing systems
  - 1.6. Concurrent design and simultaneous engineering
- UD2. Prototypes
  - 2.1. Design of prototypes
  - 2.2. Stereolithography and selective sintering
  - 2.3. Printers in three dimensions
  - 2.4. Other prototyping procedures
  - 2.5. Rapid manufacturing of tools and tools

Regardless of the present programme, students must delve into all those questions about design, simulation and other aspects of the subject that have already been addressed at some previous stage of the education system.

Throughout the development of each of the teaching units, a series of exercises is carried out, so that the evaluation system involves the double aspect of the physical examination and the preparation of works, one or several for each teaching unit.

The training activities to be carried out for each teaching unit include the following:

- UD1. Product Design and Development
  - 1.1. Fundamental concepts. Product life cycle
  - 1.2. Improvements to design, traditional design and concurrent design
- UD2. Prototypes
  - 2.1. Design and manufacture of prototypes
  - 2.2. Rapid prototyping and three-dimensional printing

In accordance with the guidelines of the European Area, this subject sets out as a working methodology the system of continuous evaluation, which is considered suitable for this subject since, as indicated above, its contents require structured, consolidated and exercise-based training leading to reflection on approaches and the correct assimilation of content, a situation that is materially impossible to obtain if one tries to deal with the matter with very few days of dedication (Martin-Erro, Domínguez, & Espinosa, 2016).

This system of continuous evaluation results in:

- Distance evaluation tests (on line)
- The performance of a mandatory face-to-face training
- Performing one or more personal evaluation exams

### **3.1. Distance evaluation tests (on line)**

They are a basic aid for the pupil and are intended to ensure that the subject is monitored methodically at regular intervals in order to ensure the correct acquisition of knowledge. This subject is an eminently practical subject. In this sense, it is very important to carry out design exercises, because it is through them that the language of the subject will gradually be assimilated. Thought must be given to each of the exercises, since it is this reflection that will lead to understanding, a fact that will not be given if one looks ahead to solving the problem.

The proposed exercises in the evaluation tests are of increasing complexity. Therefore, its sequential resolution is important. A total of two evaluation exercises structured in blocks are foreseen, in the idea of solving and delivering a test every thirty days.

### **3.2. Training (face to face)**

Face-to-face training is carried out at the School's facilities in Madrid in order to familiarize the student with the use of advanced industrial design equipment and tools. In practice, in addition to using computer-based design tools, other machines such as a three-dimensional scanner or a 3D printer can be used.

### **3.3. Personal evaluation**

They represent the key element for the evaluation of the course. In order to take the test, the student can count on all the necessary reference material, provided that it is in paper format, since the subject does not require memoristic efforts.

The evaluation of the personal test will assess positively that all the questions raised are answered, avoiding as far as possible leaving blank answers. It should be borne in mind,

however, that serious errors in the various responses may, in certain cases, give rise to a negative rating. The exercise may have a theoretical part, to be answered in the conventional paper supplied for the purpose, and a graphic part, which must be answered inexcusably on a drawing paper. There are two calls for this test, one in June, ordinary, and another in September, extraordinary.

#### 4. Distance learning methodology

Most of the academic activity of the course is carried out through the internet (M. del M. Espinosa & Dominguez, 2000). Enrolled students enter the course page (Figure 5), where they find the contents to be studied and the exercises to be carried out, some of which are developed collaboratively (Romero, Domínguez, Espinosa, & Domínguez, 2015) as well as sustainability factors (Sierra-Pérez, Domínguez, & Espinosa, 2014)(M. del M. Espinosa & Domínguez, 2003a). You will also find here the different forums, one for each of the exercises you have to solve in the distance assessment tests plus others on general consultations, on the implementation of the internship or for the exclusive communication of students with each other. In these forums the student can raise doubts and communicate with other students or teachers (figure 6).

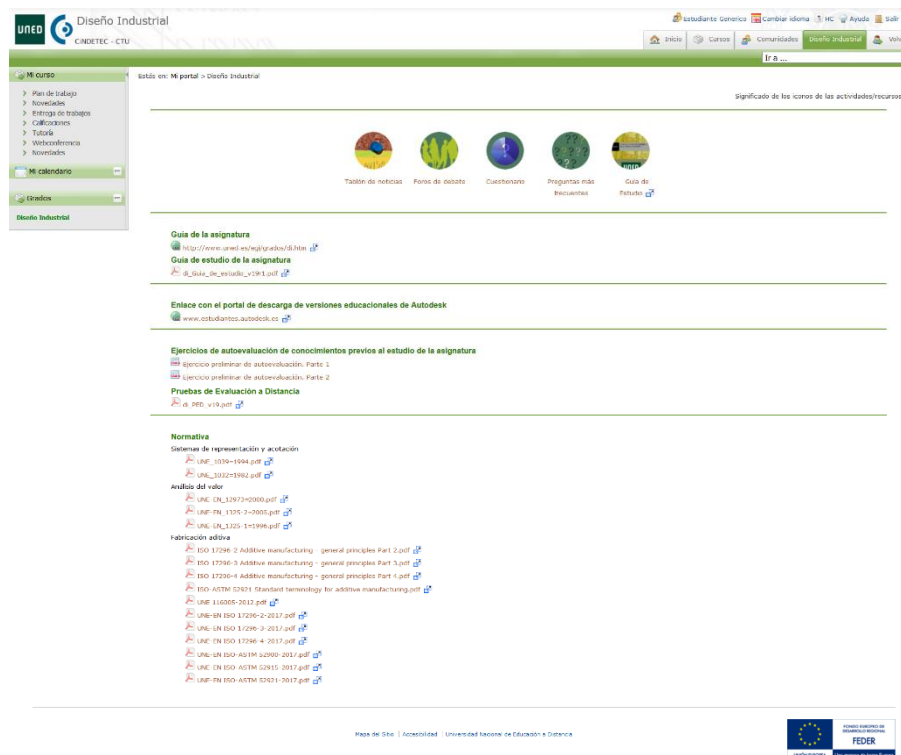


Figure 5 Internet Course Access Page

Figure 7 shows the page where students find the statements of the exercises they are to perform. Each student has their own site with specific folders to upload the solution to the proposed exercises.

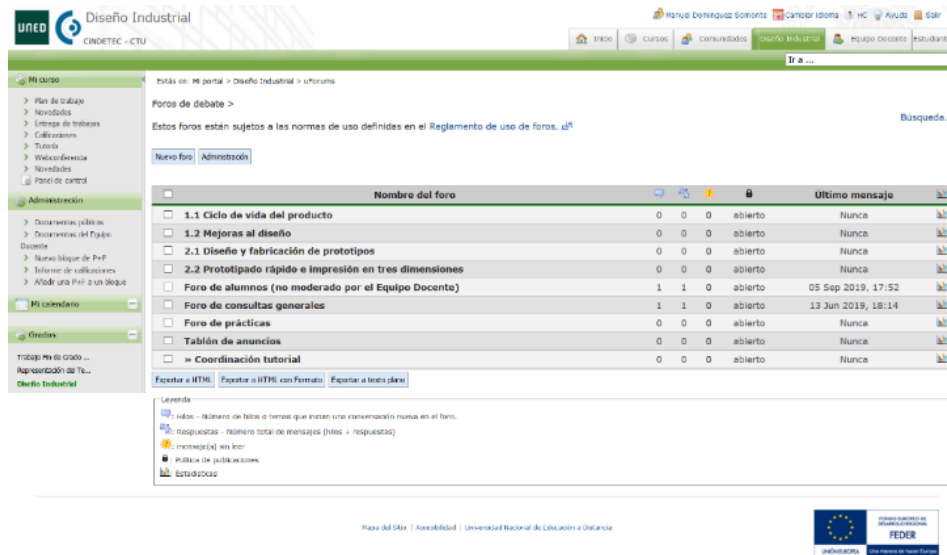


Figure 6 Online Course Forums

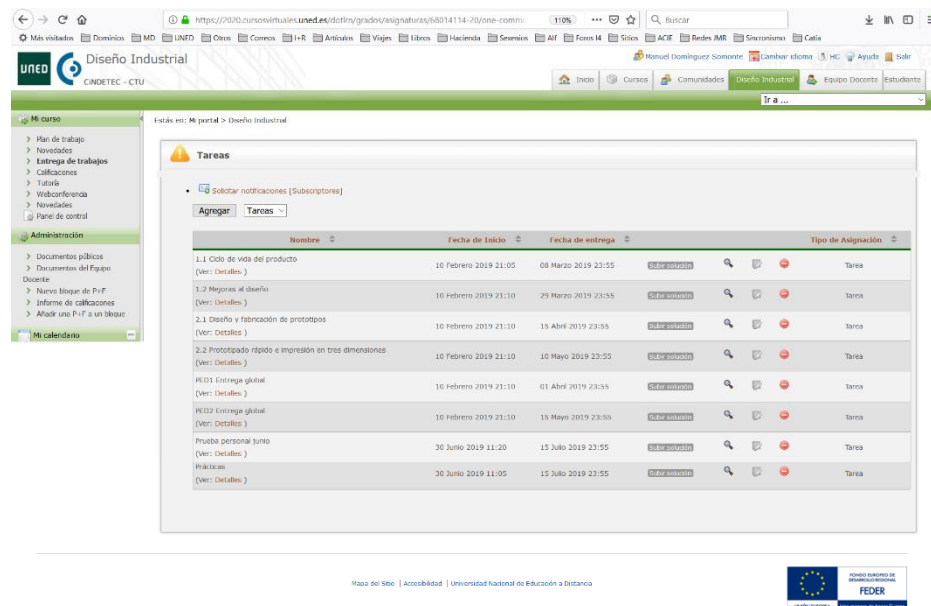


Figure 7. Online course exercises

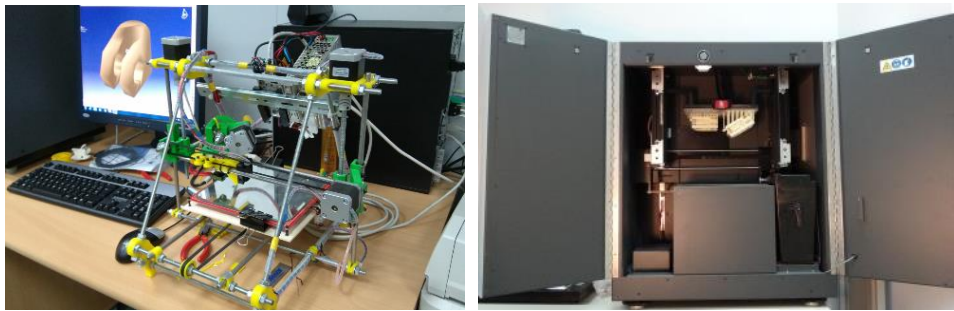
## 5. Face-to-face learning

This phase, which we call face-to-face practices, aims to exchange information directly with teachers and other students; and to carry out a series of practical exercises with project methodology. This time is usually the only time in which the student has in-person contact with the teachers or their classmates of the course since the examination, although it is face-to-face, is not normally done in direct contact with teachers of this particular subject.

It is not easy for students to have access to professional teams in the field of engineering design, which is why these face-to-face practices are important. In these sessions, students operate state-of-the-art scanning equipment (figure 8) and 3D printing equipment (figure 9). Specifically, in figure 9 to the left we can see a 3D printer model Azara, developed in our facilities with mainly didactic objectives.



*Figure 8. Scanning equipment*



*Figure 9. 3D Printing Equipment*

### **5.1. Development of the training practices**

In this session, apart from contacting other students and their teachers and managing sophisticated design equipment, students must develop a project. This is a relatively complex project but can be fully implemented in an eight-hour session, four in the morning and four in the afternoon with a lunch break.

Small-scale exercises are proposed, such as the design of a spoon for an ice cream or yogurt, which should be 'used and thrown away' and accompany the product along with the container, or a promotional bottle opener. At all times students are reminded that we are in a course of design, so aesthetics is very important. To do this, the exercises always propose that this small piece that is being designed will be part of the company's promotion system; so they will have to study geometry, colours and logos to make the product attractive.

Some of the sketches developed in the last session of these practices are illustrated in Figure 10. Production factors affecting the future manufacture of the product are always taken into account (Rodríguez, Domínguez, & Romero, 2016) (Oriozabala, Espinosa, & Domínguez, 2016).



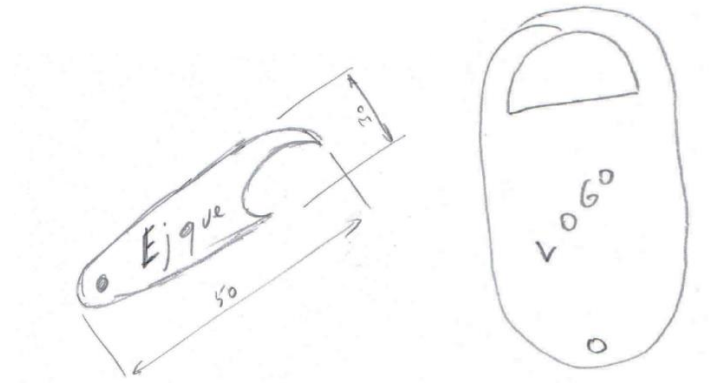


Figure 10. Sketches by students

Once the student is satisfied with the sketch done, he goes on to the modeling phase in some systems of assisted design (figure 11).

From the solid model is obtained the file with the data for the printing, the manufacture of which is simulated first on the computer (figure 12), and then physically obtain the result thanks to the 3D printing (figure 13).

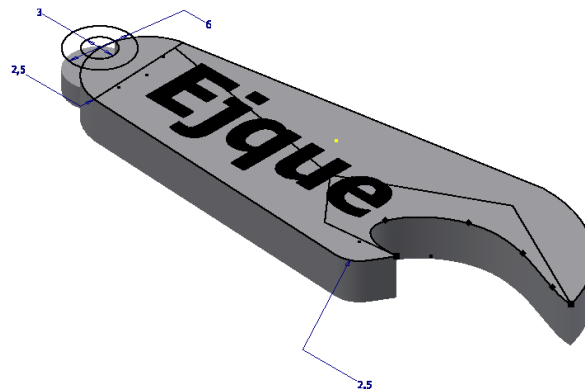


Figure 11. Modelling phase with assisted design system

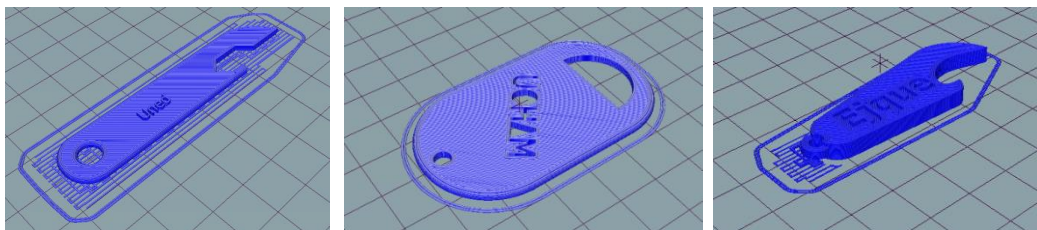


Figure 12. Modelling phase with assisted design system



Figure 13. Physical production of the designed product

## 6. Conclusions

Blended learning is the teaching methodology of the future, no doubt. It has great advantages because it combines the peculiarities of face-to-face teaching with the flexibility of distance learning.

In the field of design, as has been indicated, it is necessary to work with exercises and projects since "to design you learn by designing". These works can be developed with collaborative methodologies, but when it is necessary to work with machines of industrial production, own in the fields of engineering, it is highly desirable for students to travel to production sites so that they can see firsthand how these types of units work.

After ten years of teaching in the field of industrial design in accordance with the Bologna guidelines, blended learning has proved to be the best possible option for dealing with this subject. Students leave with a very high degree of satisfaction, and success rates are among the best possible at a distance university.

## 7. Acknowledgements

This work has been made possible thanks to the support given by the Escuela Técnica Superior de Ingenieros Industriales of the Universidad Nacional de Educación a Distancia (UNED), within the framework of project ICF06-2019.

## 8. References

- Cañedo-Argüelles, E., & Domínguez, M. (1999). Estado actual del prototipado rápido y futuro de éste. *XI Congreso Internacional de Ingeniería Gráfica*, 3, 1242-1255.
- Espinosa, M. del M., & Domínguez, M. (2000). Utilización de aulas virtuales en la docencia del dibujo técnico. *II Congreso Iberoamericano de Informática Educativa Especial – CIIEE'2000*, 6.
- Espinosa, M. del M., & Domínguez, M. (2003a). El ciclo de vida de un producto desde la perspectiva de la ingeniería concurrente. *Plásticos Universales*, 85, 5.
- Espinosa, M. del M., & Domínguez, M. (2003b). La ingeniería concurrente, una filosofía actual con plenas perspectivas de futuro. *MetalUnivers*, 16, 16-20.
- Espinosa, M. M., Núñez, G., & Domínguez, M. (1999). Integración de contenidos multimedia y sistemas de autoevaluación en un proyecto de aula virtual en expresión gráfica en la ingeniería. *II Congreso Iberoamericano Expresión Gráfica. Salta. República Argentina*, 1, 77-82.

- Iserte, E. G., Espinosa, M. del M., & Domínguez, M. (2012). Métodos y metodologías en el ámbito del diseño industrial. *Técnica Industrial*, 300, 38-46.
- Martin-Erro, A., Domínguez, M., & Espinosa, M. del M. (2016). New computer-aided design tools applied on engineering design. *Ingeniería Educativa*, 10, 11-14.
- Martin-Erro, A., Espinosa, M. del M., & Domínguez, M. (2015). Methods and Tools Applied on Conceptual Design Process: Results of an Empirical Study. *DYNA*, 90(4), 380-385. <http://dx.doi.org/10.6036/7212>
- Martín-Erro, A., Espinosa, M. M., & Domínguez, M. (2018, noviembre). *Creativity in the formative curriculum of our industrial engineers*. 8926-8933. <https://doi.org/10.21125/iceri.2018.0645>
- Oriozabala, J. A., Espinosa, M. del M., & Domínguez, M. (2016). Additive Manufacturing Opportunities to Optimize Product Design. *DYNA INGENIERIA E INDUSTRIA*, 91(3), 263-271. <http://dx.doi.org/10.6036/7661>
- Prádanos, R., Sanz, J. M., González, J., Escudero, L. E., Sola, R., Hernández, L., ... Sola, J. I. (2009). Prácticas interactivas de dibujo técnico. *XXI Congreso Internacional de Ingeniería Gráfica*, 9.
- Rodríguez, L., Domínguez, M., & Romero, L. (2016). Analysis and Validation Model of Design Proposals through Flexible Prototypes. *DYNA INGENIERIA E INDUSTRIA*, 91(1), 502-506. <https://doi.org/10.6036/7812>
- Romero, L., Domínguez, I. A., Espinosa, M. D. M., & Domínguez, M. (2015). Team Work Aptitude Development in the Field of Concurrent Engineering through ICT Tools: Collaborative Engineering. *International Journal of Engineering Education*, 31(1-B), 292-301.
- Romero, L., Domínguez, I. A., Espinosa, M. del M., Domínguez, M., & Jiménez, M. (s. f.). Collaborative Engineering in Distance University Master's Degree. *Proceedings of INTED2015 Conference*, 0958-0967.
- Salido, M., Bernal, C., & Domínguez, M. (2002). La innovación tecnológica en la enseñanza a distancia del dibujo técnico por ordenador. *Informática Educativa. Tecnologías de la información y la comunicación para el aprendizaje*, ISBN: 84-699-8711-9/84-699-8712-7, 8.
- Sierra-Pérez, J., Domínguez, M., & Espinosa, M. del M. (2014). El ecodiseño en el ámbito de la ingeniería del diseño. *Técnica Industrial*, 308, 42-49.
- Vallecillo, R., & Domínguez, M. (2018). Innovación educativa en un curso cero de dibujo técnico para el acceso a los grados de ingeniería de la UNED / Educational innovation in a zero course of technical drawing for access to the engineering degrees of the UNED. *X Jornadas de Investigación en Innovación Docente de la UNED. Innovación educativa en la era digital*, 7.
- Vallecillo, R., Prádanos, R., Núñez, G., Romero, L., Domínguez, M., & Espinosa, M. M. (2018a, noviembre). *Training deficiencies in secondary school: Causes of demotivation and premature abandonment of university students*. 9070-9079. <https://doi.org/10.21125/iceri.2018.0677>
- Vallecillo, R., Prádanos, R., Núñez, G., Romero, L., Domínguez, M., & Espinosa, M. M. (2018b). Utilización de TIC en un curso 0 de dibujo técnico, pilar fundamental en la formación del futuro ingeniero. *CUJAE. Memorias del 19CCIA*, 12.

## Building learning analytics cMOOC for teachers and learning designers through online collaboration between universities

### Seppo Nevalainen

Karelia University of Applied Sciences, Finland  
seppo.nevalainen@karelia.fi

### Jukka Kurttila

Oulu University of Applied Sciences, Finland  
jukka.kurttila@oamk.fi

### Riikka Muurimäki

Seinäjoki University of Applied Sciences, Finland  
riikka.muurimaki@seamk.fi

### Sami Suhonen

Tampere University of Applied Sciences, Finland  
sami.suhonen@tuni.fi

### Abstract

In Finnish universities of applied sciences learning analytics has not been on the agenda until recent years. The activity is still largely based on individual teachers' enthusiasm and the faculty in general is not well aware of what learning analytics is about and what it can provide to teaching and learning. In recent years Finland has had several large national projects which are related to learning analytics. One of the first ones was "eAMK-project" in which Learning analytics was included as a minor part. In the project, it was soon realized that the knowledge and skills of an average teacher needs to be boosted in this field. Therefore, a cMOOC course was created – the very first in learning analytics in Finnish. The course is targeted mostly for teachers and learning designers. After completion of the course, participants should have the readiness to start using learning analytics in their work. Showing the mastery of the new skills, they are also encouraged to apply for "Expert in Learning Analytics" digital badge.

The course was developed collaboratively among six universities of applied sciences in Finland. The developers met each other periodically in face-to-face project meetings but most of the course construction work took place online. In this article, the structure and contents of the course are described. Also, the building process and the different elements and methods required for the online collaboration are explained. Before opening the course, it was evaluated using quality criteria for online implementations developed by national eAMK-project. The first implementation of the cMooc was held in spring 2019.

**Keywords:** cMOOC, online collaboration, learning analytics, co-teaching

### 1. Introduction

Learning analytics has been one of the emerging trends in education science in the last 10 years (See for example Slade & Prinsloo, 2013; de Freitas et al, 2015; Avella et al 2016), and it has found its way also to Finnish

educational environment. Activity around learning analytics has however been mostly based on individual teachers' enthusiasm, and general understanding of learning analytics and its inclusion into practical pedagogical tool sets of individual universities of applied sciences has been sporadic. Ministry of Education and Culture has tackled this problem by launching several large national projects related to learning analytics, including eAMK (eAMK, 2019a).

In eAMK project, a separate work group within one of project's main three themes was dedicated to questions related to learning analytics, and as one of its main tasks the group decided to design and implement an online learning analytics course targeted for teachers and learning designers. The course was created as a cMOOC distributed through Moodle platform. In this article, the design process for that cMOOC with necessary background context is provided, and challenges and successes from the process are discussed. In addition, some observed best practices concerning joint course creation through online collaboration between universities are presented.

## 2. Background

eAMK is a 3-year development project funded by the Ministry of Education and Culture. The project takes place between May 1, 2017 and April 30, 2020, and it has approximately 300 members from 23 (92%) universities of applied sciences as participants. In the project, "experts, students and working-life interest groups of universities of applied sciences will combine their strengths and renew both their mode of operation and learning" (eAMK, 2019a). The project is divided into three themes, the third one being about digitalisation of the university of applied sciences' pedagogy. Within this theme, the learning analytics was identified as one main focus point, and therefore a separate work group was created around it in the first joint meetings of the project through open invitation presented to all eAMK-participants. Role of learning analytics in the context of the entire eAMK project is presented in Figure 1. The learning analytics group raised wide interest and gathered around 12 active core members that came from 8 universities of applied sciences situated around Finland.

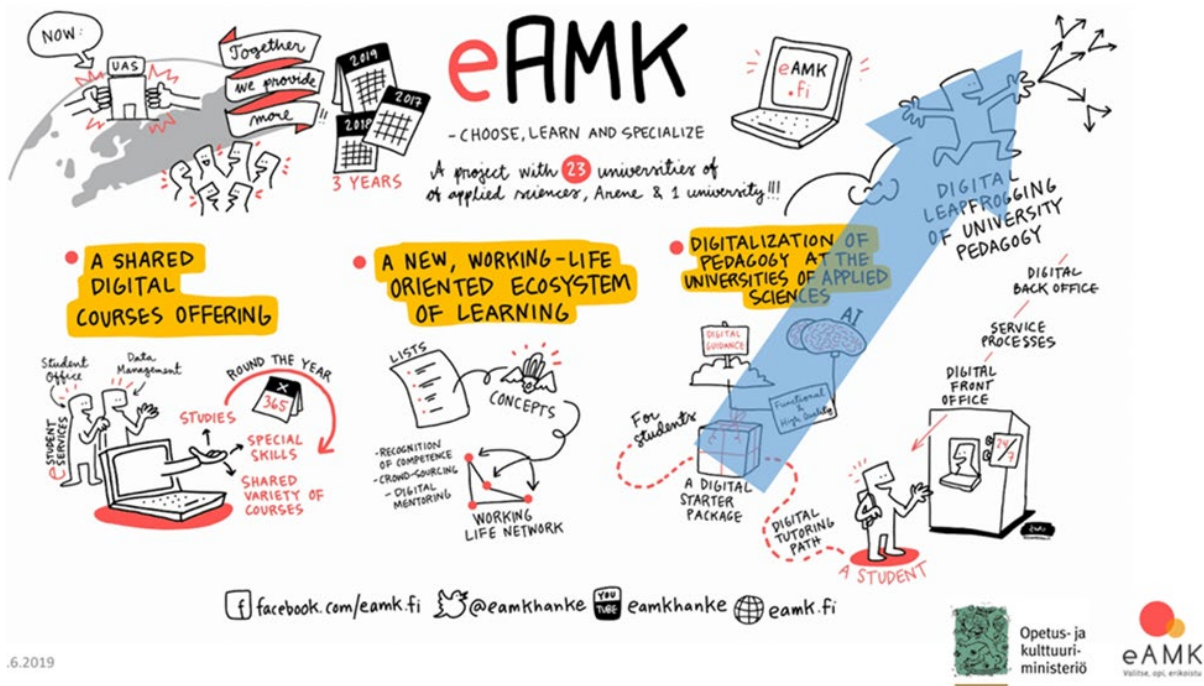


Figure 1: Role of learning analytics in the context of the entire eAMK project.



### 2.1 Goals of the learning analytics group

The eAMK project has identified two general level goals for the theme 3. The theme has been responsible for 1) improving digital competence within different higher education institutions (HEIs), and 2) ensuring digipedagogical know-how of HEIs' educational staff (eAMK, 2019b). For learning analytics group this meant in practice helping teachers and learning designer in their efforts to introduce and further use learning analytics as a part of their everyday toolkit. In addition, the group was expected to provide support for student counselling through learning analytics.

When the learning analytics group started its operation in late Spring 2017, its members soon realized in their first work meetings that since learning analytics in Finnish educational environment is still quite a young phenomenon, as commented also for example by Auvinen (2017), there does not yet exist established consistent terminology to discuss different aspects of learning analytics and to share knowledge. This had been observed also by Finnish learning analytics network (Oppimisanalytiikkaverkosto, 2019). In addition, practical applications of learning analytics seemed for the group to be only a few, including for example Ville learning environment developed by Turku University (Laakso & al. 2018), and L.O.U.H.I, developed by Karelia University of Applied Sciences (Gröhn, 2019).

In order to best help teachers and educators with learning analytics, the group first therefore needed to identify the current state of learning analytics use in Finnish education field and map out available technical learning analytics tools and platforms. Based on the outcomes from these initial steps, actions for reaching the goals of the group could then be planned. In early Autumn 2017 group had one of its first face-to-face meetings, during which initial sketch for group's operational timeline (Figure 2) was created. Later the sketch was formulated into a Microsoft Project document presenting the goals and the needed actions (Figure 3).

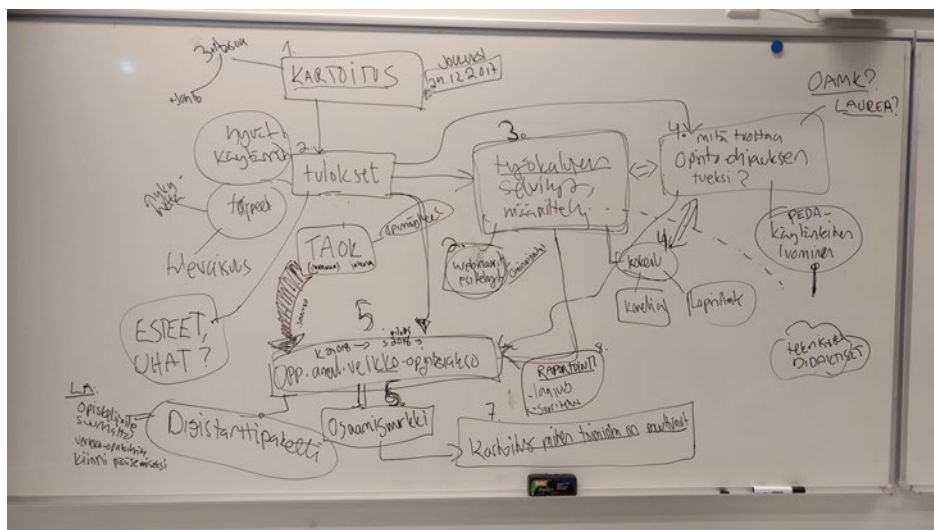


Figure 2: Initial sketch for learning analytics group's operational timeline



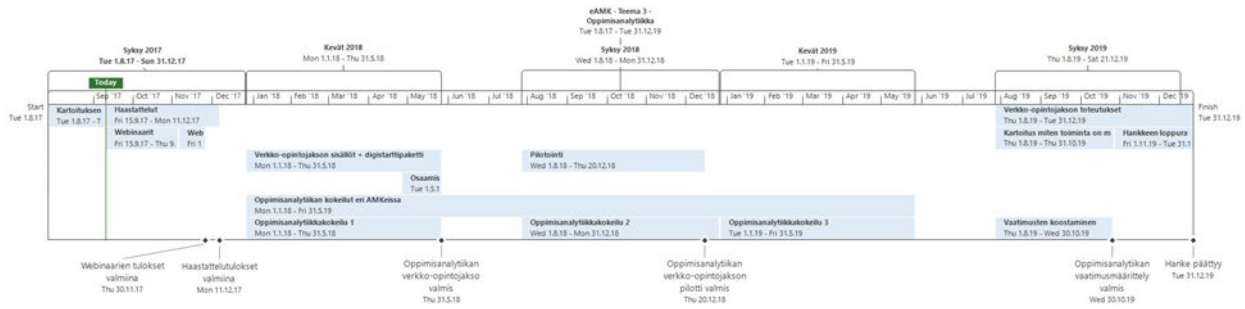


Figure 3: Analytics group's operational timeline as a Microsoft Project document.

In the timeline analytics group's activities were divided into four steps that were in chronological order 1) mapping out the current state of learning analytics use in Finnish universities, 2) benchmarking existing technical solutions for applying learning analytics in teaching and other educational activities, 3) creating an online learning analytics course (later cMOOC) targeted for teachers and learning designers, and 4) reporting the outcomes of the project to broader public. Steps 1 and 2 provided valuable and necessary background for the course creation process, which will be described in detail in the following chapters.

### 3. Establishing the method for course creation

After defining its goals, the learning analytics group put the timeline described above into action. Since the group was geographically dispersed, having members from 6 universities of Applied Sciences (Figure 4) that were located all around Finland, joint protocol for communication and collaboration was needed. In this case, group decided to rely mainly on Yammer social networking tool (provided by the eAMK project) as a discussion base, O365 OneDrive for sharing collaborative files and regular Skype-meetings for online communication. In addition, 1- to 2-day face-to-face working meetings were organized by the eAMK project approximately every 3 Months. These meetings also helped the group to work in cooperation with the other two themes.



Figure 4. The cMOOC was built in collaboration between six universities of applied sciences.

When the group had carried out its steps 1 and 2 during Autumn 2017, it turned its collective eyes into creating the learning analytics course in Spring 2018. During first more detailed discussions in working meetings held regularly through Skype and face-to-face, the group immediately faced a situation, where initial timetables needed to be re-planned. This was due to the question regarding how to reward students completing the cMOOC. This question proved to be a challenging one to address, since the target group for the course was so heterogeneous, coming from different institutions and different positions; for example teachers, administrative staff, learning designers, IT-support staff. After lengthy discussions, the group decided to use learning badges. If some institutions would want to provide credit units for participants taking the course and completing the badge, they could then do it at their end. In addition, the desire to have a learning analytics learning badge was presented from the eAMK project, so that the badge could be included into their learning badge family (eAMK, 2019c). The decision to have a learning badge created the need to design and have one ready during Spring 2018, which meant that actual design phase for the course itself shifted to Autumn 2018.

### **3.1 Creating a road map for online co-operation between workgroup members from different organizations**

When the group started course design phase in Autumn 2018, a detailed road map for that particular task was created, and preconditions and needs for co-operation were identified. Group decided to 1) dedicate Autumn 2018 for course architecture design and content creation, 2) have the content evaluated against eAMK quality criteria in January 2019 (eAMK, 2019d), and 3) have first course implementation in Spring 2019.

When considering preconditions for course creation, group members run into a different situation compared to the earlier steps, where the work carried out by members from different institutions was by its nature more isolated and targeted either the institution itself (step 1) or a provider of technical learning analytics solution (step 2). In steps 1 and 2 Bulk of the work could be done separately and need to join the fruits of the labour existed only at the end, when reporting the results. Now the group faced the challenge of creating a joint uniform course design despite the fact that 1) the team was geographically dispersed, 2) it needed to work mostly separately, and 3) it had chances to meet face-to-face only approximately every 3-4 months. This challenge was (at least) two-fold; 1) how can the group communicate as instantly and as efficiently as possible and 2) how the group can share the artifacts being created during the collaborative design process as instantly and as efficiently as possible.

### **3.2 Deciding the communication protocol & the technical tools**

During all steps, the group worked most of the time online. It was natural to choose the cloud-based tools for use of the group. Following requirements and objectives for the tools were identified by the group:

- Fluent information sharing between team members.
- Efficient and easy collaborative online working.
- 24/7 access to data and communication history.

The existing ways of communication and selected communication tools from steps 1 and 2, were found to have been well-functioning. The group did not find a need to change the communication protocol or add new tools even for this more collaboration intensive step 3.

However, in this 3rd step different members of the group did not work with their own contents in their own documents located in their own environments anymore. Instead, the content initially created by each member needed to be eventually included directly into the same course environment. To address this requirement, the group decided to use Moodle as their course platform, and had ensured its accessibility to all the content

creators from the very beginning of the course creation process. This enabled course content creation to take place directly inside the final course environment under collaborative critical observation, which helped in the efforts to ensure consistency and quality of the materials

#### **4. Crafting the course**

When the learning analytics group had created the roadmap and timeline for the course design, it was ready to continue with the course architecture design and content creation. Tasks included defining the learning objectives, defining the learning process and deciding on pedagogical model. In practice this meant choosing the course format, gathering and acquiring background materials, selecting the course platform, creating course topics and assignments, and implementing the evaluation process for the course.

##### **4.1 Choosing the course format; cMOOC**

Abbreviation MOOC comes from the term "Massive Open Online Course" (Kaplan A., Haenlein M., 2016). So, MOOC means an open and free network course for everybody. There are different types of MOOCs: cMOOCs and xMOOCs. xMOOCs (extended MOOCs) are more traditional learning approach of knowledge where participants watch videos and perform tasks that are automatically reviewed. The studying is independent. The letter C in front of the MOOC refers to concepts "Cooperative Learning", "Collaborative Learning". The letter 'C' may also refer to the concept "Connectivism" (Daniel, 2012).

"Basics of Learning Analytics" MOOCs course format was chosen to be cMOOC. Collaborative learning refers to acting and studying interactively, for example, in discussion areas where participants share information and ideas. It has been shown that use of Forums in MOOCs is correlated with better grades and higher retention (Coetzee, et al., 2014). Collaborative learning means communicating new knowledge and sharing expertise. Both ways of learning apply with this MOOC. In addition, participants also have the opportunity to personalize their knowledge. Working is based on independent work, but communal interaction and knowledge sharing are an essential part of the tasks.

The course was targeted mostly for university teachers and learning designers. The idea and goal was to 1) up-skill teachers and learning designers in the use of learning analytics, 2) to have as nationwide and as thorough coverage of participating educators as possible, and 3) to help in creating an active community of Finnish educators involved in learning analytics. For reaching these three goals, cMOOC format was found to be the proper choice.

##### **4.2 Acquiring background materials**

Through steps 1 and 2 group acquired valuable information about the current state and future plans of the learning analytics use in Finnish universities of applied sciences, and benchmarked existing technical solutions for learning analytics. Additionally, the group utilized a literature survey (Järvinen et al., 2018) about the current state of learning analytics in Finland, which was carried out by students of vocational teacher education in Tampere University of Applied Sciences and commissioned by the eAMK project. With this body of background materials, additional references and especially own experiences from different learning analytics pilots implemented during the eAMK project, the group was ready to move into making final decision(s) about the course platform(s) and then to creating the actual contents for the course.

##### **4.3 Selecting the course platform**

When deciding the course platform(s), the learning analytics group had following primary desires: 1) course should be easily available to any member of a Finnish educational institution, 2) course should support community building, and 3) course should be able to continue its existence also after the eAMK project and

without a centralized dedicated moderator. When examining these desires together, the group soon realized that the desires conflicted with each other in many challenging ways. At some point a dual platform model consisting of Moodle course environment already up and running by Tampere University of Applied Sciences and of a new LinkedIn group established by course creators was suggested. According to the dual model, Moodle (Figure 5) would host all the course materials and assignments, and as its final assignment would guide participants to join the LinkedIn group (Figure 6), which would this way become an independent self-sufficient community of learning analytics developers, users, and enthusiasts. This combination seemed to be able to address all the desires without causing unnecessary additional complexity into the course design.



Figure 5. The team chose Moodle LMS to develop and define course content, track student progress, and measure and report student outcomes.

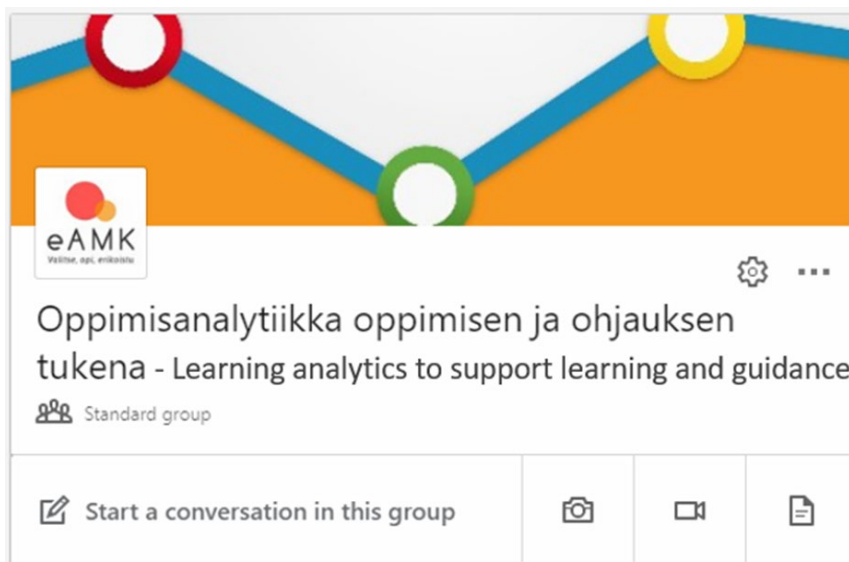


Figure 6. LinkedIn group is an independent self-sufficient community of learning analytics Developers (<https://www.linkedin.com/groups/12123362/>)

#### 4.4 Creating course topics and assignments

When the group started creating the topics for the course, one of the first questions it needed to solve was how widely and to what extent different areas of learning analytics should be covered. Since the target

audience consisted of teachers and learning designers from any field and with various technical backgrounds, the group decided that the course itself should provide basic information about learning analytics with no requirements for previous knowledge on the topic. Following this general idea, the course was divided into six topics: What learning analytics means? data protection and ethics, examples on learning analytics with Moodle, data sources and interfaces, summarizing end assignment, and LinkedIn-group for learning analytics. After the topics were jointly decided, individual members of the learning analytics group selected individual topics to work with, based on their own interest, experience and expertise.

Since one of the goals of the course was to support community building, discussion forums with asynchronous peer commenting were preferred wherever it was reasonable. In topics that were more of a technical nature, also quizzes were used. This way the course design tried to strengthen the interactions between participants, so that when they completed the final assignment of joining the LinkedIn group for learning analytics, they would already have some existing culture of communication between them. Structure of the entire cMOOC is presented in Figure 7.

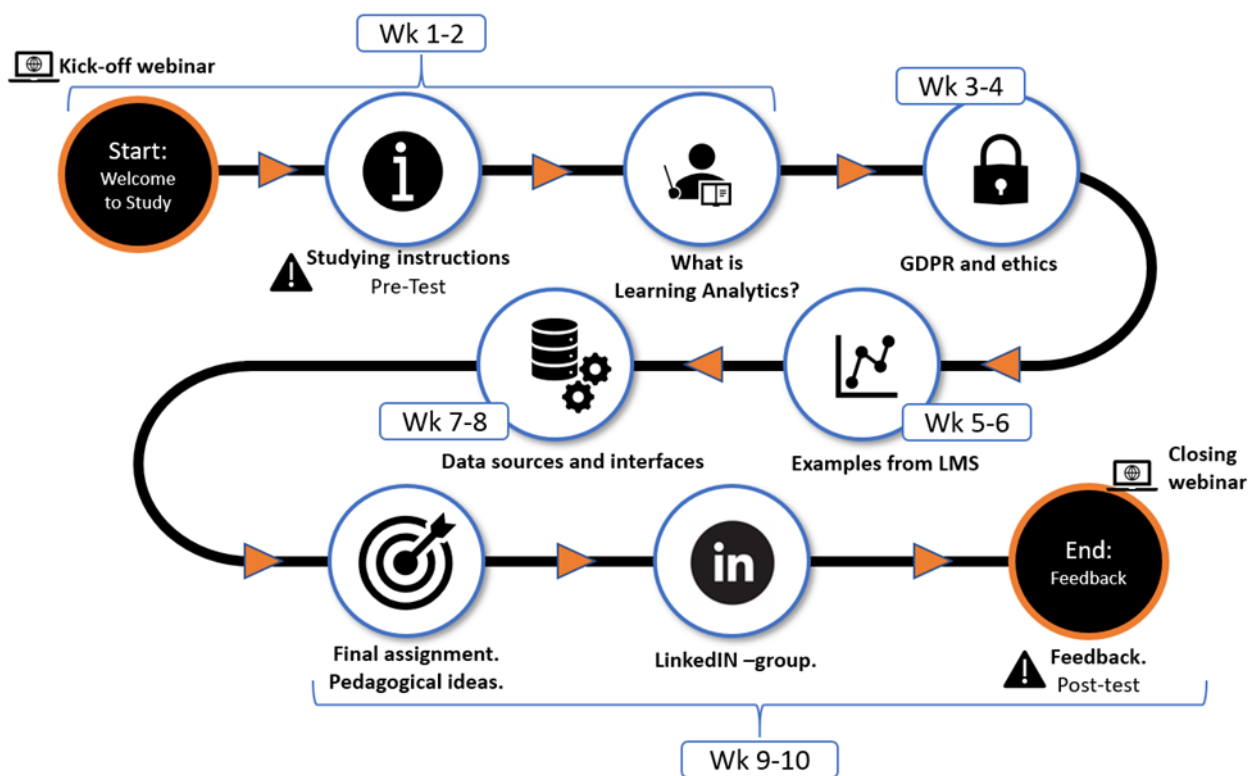


Figure 7. Structure of the cMOOC and week progress.

#### 4.5 Defining the evaluation method for the course

There were wide discussions about grading the course by giving credit units of the cMOOC, but finally the group decided against it, and decided to utilize learning badges. Main reasons behind the decision were that in order to be able to give credits to participants, the cMOOC would have needed to be added to each university's curriculum or offered as an open course. This procedure would have also demanded the group to give the evaluation criteria to each university and find a resource to handle all the evaluations. Instead, the course was designed to be only material providing platform with only assignments that are reviewed automatically or marked as completed by the participant herself. When an individual participant wants to have the completed course graded and rewarded, she can apply for the expert in learning analytics badge, which is managed by the eAMK project and its possible successors.



Open Badges had also other benefits in addition to making the evaluating of this kind of a cMOOC course easier to manage. For example, Open Badges can be added to an electronic portfolio or CV, your own website, LinkedIn profile or your information in the staff Intranet. Open Badges allow teachers to demonstrate their skills and achievements to a future employer. Open Badges also promote awareness of colleagues' skills in working communities.

By completing the course and successfully acquiring the "Oppimisanalytiikan osaaja", "Expert in Learning Analytics" badge afterwards, teacher knows what learning analytics means. She understands what type of information is created in learning environments and systems to support teaching and, based on this knowledge, she is able to plan her own courses in a pedagogically meaningful way from the perspective of analytics. She is able to utilise analytical data in guiding students and monitoring the progress of their students.

## **5. Retrospective**

In this chapter, we will consider challenges and successes the learning analytics group faced during the course creation process described above. We will also identify the key points ensuring the successful end result for the cMOOC that attracted 426 participants in its first scheduled implementation in Spring 2019. Analytics concerning this scheduled Finnish learning analytics cMOOC are presented in another article ("Learning analytics of the first Finnish learning analytics cMOOC") in these same proceedings.

### **5.1 Challenges**

During the course creation process, challenges emerged from the young age of learning analytics as a research field, and its lack of practical applications at least in Finnish educational environment. This meant that learning analytics is in general still quite unformulated topic with ambiguous use of terminology; how then can we make sure we speak a common language with each other and to the participants. Another challenge we faced was to be sure that we will cover all the necessary and relevant parts of the learning analytics in our course in adequate but not in unnecessary detailed level, especially since course's target group is quite heterogeneous. In order to address possible shortcomings in this regard, detailed student feedback was collected from the course and combined with analytics data collected by other means. This analytics data is presented and discussed in another article ("Learning analytics of the first Finnish learning analytics cMOOC") in these same proceedings. Possible future inclusions and exclusions of topics, and topics' reformulations for the course are done with the help of the feedback and analytics data. The third challenge was the cultural change from switching the credit unit points to an Open Badge. Open Badge also being a quite new way of acknowledge credits.

### **5.2 Successes**

Roadmap and detailed background analysis carried out in steps 1 and 2 ensured straightforward design process for the course: One possible caveat for this kind of distributed design process are communicational challenges that can be caused by lack of know-how to use the technical tools. Group members had however good ICT skills, so the tools were deployed smoothly. This had surprisingly big significance to the success of the planning work and made flexible working culture possible in the group. The group worked efficiently using the cloud services e.g. Microsoft Office 365 and Google G-suite, supported by the communication in O365 Yammer. Big part of the success was played by the enthusiasm of the group members themselves.

Understanding the importance of education technology was a significant part of MOOCs development process. These skills also encouraged collaboration among peers. Technical and pedagogic challenges were solved together. Punya Mishra and Matthew J. Koehler's 2006 TPACK framework (Figure 8), which focuses on technological knowledge (TK), pedagogical knowledge (PK), and content knowledge (CK), offered approach to



many of the dilemmas that our group faced in implementing educational technology (edtech) to MOOC (Mishra P. & Koehler, M., 2006).

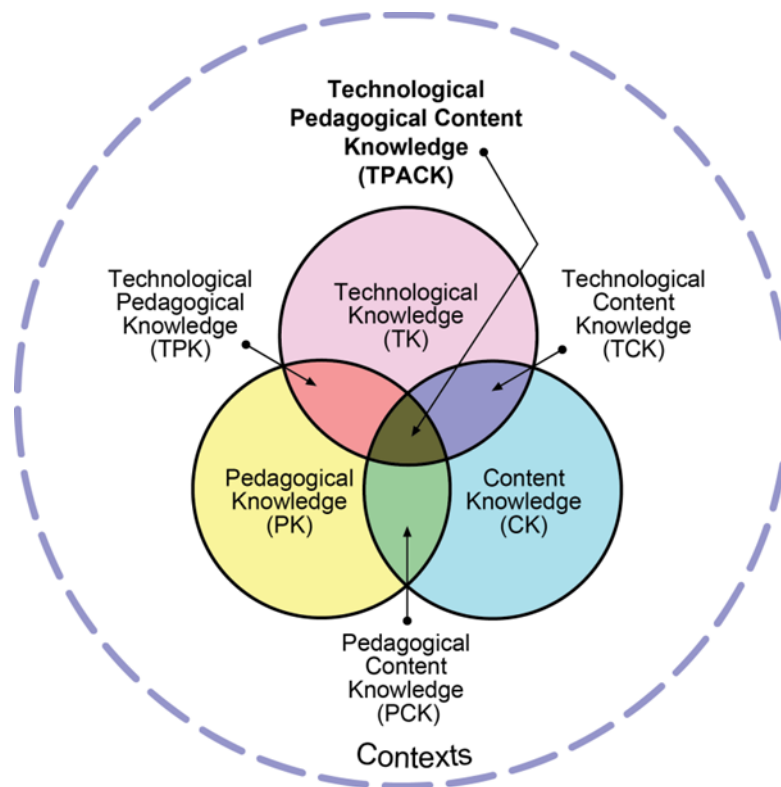


Figure 8: TPACK model (Koehler, M. & Mishra P., 2019) (Reproduced by permission of the publisher, © 2012 by tpack.org)

When evaluating the success of a design effort for the cMOOC, natural indicators are the observations made from the course itself. One goal for the course was to reach as many Finnish teachers and educational designers as possible, and to provide concise basic information about learning analytics to them. Another goal of the course was to remove ambiguity and unify the terminology around learning analytics in Finnish educational environment. Yet another goal for the course was to help in creating a diverse and active community of educational learning analytics developers and users. Detailed analytics about how the cMOOC reached these goals can be found in another article ("Learning analytics of the first Finnish learning analytics cMOOC") in these same proceedings.

### 5.3 Suggestions for cross-institutional co-operation when building online cMOOCs

Online courses, such as cMOOCs, have established themselves as one popular mode of teaching. Often these by their nature cross-institutional web-based courses are designed and implemented within one educational institution or commercial actor. In the case of learning analytics cMOOC however, also the design and implementation phases were cross-institutional and web-based. With following considerations, the authors were able to ensure successful creation of a cMOOC by a team of geographically dispersed educators with different backgrounds and from different universities:

- Even though educators in the group were from various fields, everyone had technical self-sufficiency in using technical tools (video conferencing, cloud services...) that are necessary to replace face-to-face communication as well as possible.

- In addition to the online work, it was quite clear that the first face-to-face meetings were essential to form the ground for the whole process. Everyone got to know each other, and an intense group was formed.
- The group organized its work in such a way that actual tasks were separated into different institutions as much as possible, while at the same time having a joint repository for all existing work documents for quick viewing and commenting by other group members. This enabled open work culture with joint ownership combined with clear individual responsibilities and ability to proceed with one's tasks efficiently.
- Online meetings in Skype were held steadily through the process which helped everybody to stay in touch with the process at all times.
- Creating the learning analytics cMOOC happened in the context of a large national project (eAMK) with adequate resources in the background. eAMK provided different necessary resources for the collaboration. These include for example budget for dedicated work hours and face-to-face meetings, and management of the learning badge.

## 6. Conclusions

In this article, a process of designing and building an online course for teachers and learning designers of Finnish universities of applied sciences was presented. Design and building process was carried out as online collaboration between six universities of applied sciences. At the end, a learning analytics cMOOC was created and made available to the target audience through Moodle environment along with a separate LinkedIn group. Participants successfully completing the course were able to apply for an Expert in Learning Analytics Open Badge.

Course design and creation process carried out through online collaboration between different institutions creates its own sets of challenges compared to the more typical situations, where courses are created offline and within the boundaries of one institution. However, by ensuring few important prerequisites presented here as best practices, one can face this set of challenges more successfully.

## 7. References

- Auvinen, A., 2017. Oppimisanalytiikka tulee - oletko valmis: Suomen eOppimiskeskus ry. Retrieved September 28<sup>th</sup>, 2019, from <https://poluttamo.fi/2017/08/02/oppimisanalytiikkatulee-oletko-valmis/>
- Avella, J.T., Kebritchi, M., Nunn, S.G., Kanai, T. (2016). Learning analytics methods, benefits and challenges in higher education: A systematic literature review. *Online learning Vol 20, No 2*. 1-17.
- Daniel, J., 2012. Making sense of MOOCs: "Musings in a maze of myth, paradox and possibility," *Journal of Interactive Media in Education, volume 2012, number 3*. Retrieved September 28<sup>th</sup>, 2019, from <http://jime.open.ac.uk/articles/10.5334/2012-18/>
- Coetsee D., Fox A., Hearst M.A., and Hartmann, B., 2014. "Should your MOOC forum use a reputation system?" *CSCW '14: Proceedings of the 17th ACM Conference on Computer Supported Cooperative Work & Social Computing*, 1176–1187.
- De Freitas, S., Gibson, D., du Plessis, C., Halloran, P., Williams, E., Ambrose, M., Dunwell, I. & Arnab, S. (2015). Foundations of dynamic learning analytics: Using university student data to increase retention. *British Journal of Educational Technology Vol 46, No 6*, 1175-1188.

- eAMK, 2019a. eAMK - Oppimisen uusi ekosysteemi. Retrieved September 28<sup>th</sup>, 2019, from <https://www.eamk.fi/fi/etusivu/>
- eAMK, 2019b. Teema 3: AMK-pedagogiikan digitalisaatio. Retrieved September 28<sup>th</sup>, 2019, from <https://www.eamk.fi/fi/projekti/teema-3-esittelysivu/>
- eAMK, 2019c. eAMK Open Badge Family. Retrieved September 28<sup>th</sup>, 2019, from <https://www.eamk.fi/en/project2/tulostaulu/eamk-open-badge-family/>
- eAMK, 2019d. Quality Criteria for Online Implementations. Retrieved September 28<sup>th</sup>, 2019, from <https://www.eamk.fi/en/courses-offering/quality-criteria/>
- Gröhn, a. 2019. eAMK-hanke: Oppimisanalytiikkajärjestelmän esittely - Karelia AMK - LOUHI. Retrieved September 28<sup>th</sup>, 2019, from [https://www.youtube.com/watch?v=E\\_cHOPLiPY](https://www.youtube.com/watch?v=E_cHOPLiPY)
- Järvinen, H., Pääkkönen, K., Rantala, H., & Väänänen, M. 2018. Oppimisanalytiikka suomessa - nykytilanne, tulevaisuus ja haasteet. Tampere: eAMK. Retrieved September 28<sup>th</sup>, 2019, from [https://www.eamk.fi/globalassets/tutkimus-ja-kehitys--research-and-development/tki-projektien-lohkot-ja-tiedostot/eamk/teema-3/oppimisanalytiikka/oppimisanalytiikka---taokin-kehittamistyo\\_jarvinen\\_-paakkonen\\_rantala\\_vaananen.pdf](https://www.eamk.fi/globalassets/tutkimus-ja-kehitys--research-and-development/tki-projektien-lohkot-ja-tiedostot/eamk/teema-3/oppimisanalytiikka/oppimisanalytiikka---taokin-kehittamistyo_jarvinen_-paakkonen_rantala_vaananen.pdf)
- Kaplan, Andreas M. & Haenlein, Michael, 2016. "Higher education and the digital revolution: About MOOCs, SPOCs, social media, and the Cookie Monster". *Business Horizons, Elsevier, vol. 59(4)*, 441-450.
- Laakso, Mikko-Jussi & Kurvinen, Einari & Enges-Pyykonen, P. & Kaila, Erkki. (2018). Designing and creating a framework for learning analytics in Finland. *MIPRO 2018*, 695-700.
- Koehler, M. & Mishra P., 2019. TPACK.org. Retrieved September 28<sup>th</sup>, 2019, from <http://tpack.org>
- Mishra, P., & Koehler, M. J. (2006). Technological Pedagogical Content Knowledge: A Framework for Teacher Knowledge. *Teachers College Record, 108*, 1017-1054.
- Oppimisanalytiikkaverkosto, 2019. Analytiikkajaosto. Retrieved September 28<sup>th</sup>, 2019, from <https://oppimisanalytiikkaverkosto.fi/2018/11/26/analytiikkajaosto/>
- Slade, S. & Prinsloo, P. (2013) Learning Analytics: Ethical Issues and Dilemmas. *American Behavioral Scientist. Vol 57, No 10*, 1510 – 1529.

## Challenges of University teaching in the construction of collaborative learning spaces in distance education

**Andrea Melissa Mora Umaña**

Universidad Estatal a Distancia, Costa Rica  
mmora@uned.ac.cr

### **Abstract**

With the use of digital tools and the tendency towards virtualization, distance education counts on valuable tools to develop more cooperative, collaborative and participatory learning environments. Consequently, students are not passive subjects that receive information, but interact even in synchronous spaces where they get more feedback from classmates and teachers, construct their knowledge and share their experiences. However, this demands from teachers a higher formation in pedagogy, didactics and assessment processes, so they can plan better have understanding of social dynamics built in these environment and develop skills to effectively mediate learning.

**Keywords:** distance education, higher education, cooperative learning environments.

### **1. Introduction**

Distance education has been constrained to the development of media; therefore, it has adapted to the evolution of technologies. Nevertheless, this adaptation process is neither straightforward nor immediate. It is related to digital literacy, coverage or access, is sensitive to culture and subjected to a deep educational, pedagogical and didactic reflection about the implications of using means that disrupt teacher training in higher education.

While many of the digital platforms and current online learning systems enable the development of collaborative environments, there are still limitations in the development and management of these environments, ranging from the competencies of the students own digital literacy processes to how learning is being nurtured. Although we have been using these means in university teaching for more than three decades, it is not a surprise that, in many cases, we still try to emulate (not only simulate) face-to-face traditional education and their design by merely creating digital repositories.

In this presentation, we will address some of the challenges we have had to face for the development of more social and cooperative environments in education mediated by digital systems. Meanwhile, we take into account fundamentals of building knowledge in our species and the importance of these perspectives in the design of spaces more akin to our capabilities for cooperation and socialization (Piedra, 2014; Geary, 2011; Orey, 2010).

### **2. Starting points: human developers and knowledge building**

In the Research Program on the Fundamentals of Distance Education of the Costa Rica's University of Distance Education, we depart from the importance of formative processes as being founded and sustained by more scientific and robust proposals and practices. In this sense, it has been of our interest to study the elements underlying the processes of human formation, such as memory (Mora, 2017; Piedra, 2011a; Piedra, Cartín, Garita y Barahona, 2010), language (Mora, 2018; Arce, 2017; Piedra y Mora, 2012; D'Alton, 2005), heterotechnical cooperation (Mora, 2015; Guitérrez-Soto & Piedra, 2014; Guitérrez-Soto & Piedra, 2013;

Piedra, Mora y Luedtke, 2013; Mora, 2015; Arce, 2010; Reynolds, 1993), emotions (Piedra, 2013; Cartín, in press; Trigwell, Ellis, & Han, 2012) and in a general sense the construction of knowledge (Piedra, 2014).

Our research has departed from several assumptions:

- Cognition is the result of an evolutionary process. Therefore, it is necessary to understand its adaptive, historical and phylogenetic development aspects (Piedra, 2014; Geary, 2011; Piedra, 2009).
- Human beings are social. This implies that all its behavioral, emotional, linguistic and cognitive conformation is designed to solve social problems, such as social calculations, alliance formation, reconciliation, and sexuality, among others (Piedra, 2014, Mora, 2013; Arce, 2010).

Among all the social species on the planet, ours is one of the most social; this implies that even the course of evolution and biological adaptation processes themselves have taken that direction; for example, the human brain is known to be an organ that has evolved towards social process (Dunbar, 2010). Other cognitive processes, such as theory of the mind, Machiavellian intelligence, memory, and others, respond to this same dynamic (Piedra, 2014; Arce, 2010). Despite the differences we may encounter from one context to another or from one culture to another, social processes play a predominant role in human beings, and cooperation itself seems to be an innate process that is configured within our social groups or troops<sup>1</sup> (Arce, 2010; Arce, 2008).

Many education models do not rely on the natural ways in which our species build knowledge, which accounts for, one way or the other, the failing of or the low results in teaching (Gutierrez & Piedra, 2015). The same seems to be the case with the implementation of digital technologies; essential aspects in the construction of knowledge are lost. In addition, it is more common to give more value to the individual and the rational, detracting from social processes, cooperation, emotions and the body in digital or online learning environments.

To understand the complexity of human learning, it is necessary to consider the biological, social, psychological and cultural elements that constitute the nature of what we sell as "human beings" and what we call human developers (Piedra, 2014). The concept needs to be considered in our activities related to training or educating, because, as a previous step, it involves understanding and characterizing human beings first.

Some of these human developers are innate in nature, which means that they belong universally to the entire species *Homo sapiens sapiens*, and some of these developers are cultural or social in nature, are acquired and have become part of the differences among human groups around the world.

When we talk about human developers, we start from the idea that our brain/mind has been organized with specific devices for social coexistence; some of them might be the following:

- The theory of the mind: It is a cognitive-body-emotion-linguistic device, which helps us determine what other people might be thinking or feeling based on how they act. It is the basis of the mechanisms of empathy and heterotechnical cooperation (Mora, 2015; Piedra, 2014; Piedra, Mora y Luedtke, 2013; Piedra, 2013).
- Mimesis: It is the most powerful faculty of our brain or cognitive structure; it allows us to copy behaviors, emotions, as well as language and cognitive states. It is based on the work of mirror

---

<sup>1</sup> The troop is understood as the basic social organization of primates. Just as cetaceans are grouped in flocks, some fish in shoals, or birds in flocks, humans are grouped into troops.

neurons. In a formative context, mimesis is fundamental in the modeling of behaviors for social acceptance (Rodríguez, 2018; Piedra, 2014; Donald, 1991).

- Language modelling: it stresses the value of language as a creator of semantic and pragmatic representations, as well as emotional modes for the organization of actions, thoughts and physical disposition (Arce, 2017; Arce, 2010).
- Machiavellian intelligence: It has to do with the mechanisms developed by human beings for convictions, persuasion and manipulation. Without this social device, it would be impossible to learn socially. This device needs a higher management of contexts and subjects (Piedra, 2014; Mora, 2013; Arce, 2010).
- Setting up troop interactions: It has to do with how people organize themselves into troops, pseudo-troops or prosthetic troops, and how these forms of organization give birth to specific behaviors that are shared and emerge from the social group. It includes the differences in gender, age, worldviews, personality and resources to solve existing problems (Piedra, 2014; Mora, 2013; Arce, 2010; Arce, 2008).

All the above constitute our ways of learning, building knowledge, creating skills and competencies.

We conceive learning arises to take knowledge to memory through learning mechanisms, which can range from association to simple or complex-building of elemental-symbolic knowledge. The contents to be learned need specific channels, and complementary ones, which together form what is called the ecology of knowledge; therefore, there is declarative or conceptual knowledge, procedural and attitudinal, which should be taken into account when mediating contents, selecting or designing the means or tools to be used in learning.

This reflection suggests that, if we want to develop cooperative and participatory virtual environments, we should demand, from teachers, knowledge of the pedagogical principles and theories of learning that underpin the training proposals that are being developed.

In addition, it is important to consider how knowledge is built in our species (Piedra, 2014; Geary, 2011; Geary, 2006; Posner & Rothbart, 2006; Geary, 2005; Geary, 2004; Gibson, 2002). We know that this issue is complex, but there are elements on which we can reach consensus. For example, knowledge has the function of reducing the entropy of a system into negentropic resources (Piedra, 2014; Pozo, 2001). Our mind selects the contents that we preserve and discriminate those that are of low interest or not relevant at all (Piedra, 2011a; Piedra, Cartín, Garita y Barahona, 2010). This is a mechanism for the organization of the mind fundamental in learning, and that we should not lose sight of in the training processes.

On the other hand, knowledge helps us solve problems about all social processes and contexts (Piedra, 2014). It has a strong semantic and pragmatic accent; this implies that every knowledge must have meaning and direction to be relevant to us; otherwise, it will not be of value. Therefore, it is a great challenge for teachers in distance education and online-designed environments to take into account these cognitive, biological, emotional, linguistic, bodily aspects, among others (Piedra, 2014; Pozo, 2001).

### **3. Learning environments in distance education: transition between synchronous and asynchronous**

We can characterize learning environments as a set of elements, functions, activities and participants of the training process. In distance education, we have been able to recognize some basic characteristics of these environments (Mora, 2016a):



- They are more dynamic.
- They require sudden changes and adaptations to new tools or updates.
- They rely on different mediational resources (traditional -digital, linear-multimodal).
- They remain asynchronous, but with higher levels of spatial and temporal (asynchronous) matching.

In this regard, we have identified at least three general scenarios.

First, an asynchronous scenario that mainly relies on self-managed resources (a more technocratic style) and is oriented to individual and solo learning. In this scenario, the resources correspond to teaching guides and audiovisual means for individual consultation. These can be supported by the traditional form of distance education models or by digitally (virtual) assisted platforms.

A second scenario corresponds to the synchronous where you can find the digital tutorials or tools that allow you to match in space and time. This has demanded the use of multi-diverse and interactive mediational resources that, in turn, have promoted more collaborative and social environments. Of course, these collaborative and social environments can be usefully rich depending on the teacher's strategy used to promote these spaces and their pedagogical proposals.

We have a third scenario that combines the above, so there are asynchronous and synchronous scenarios that enrich student's learning experiences because they use different resources and means. However, the asynchronous is still supported by, mainly, traditional and technocratic approaches, and the latter, in some cases, on constructive tendencies that depend on the intentions of teachers and the guidance they give in the training process and learning concepts.

The scenario in which synchronicity is predominant prevails in first-order cybernetics, where relations are 1:1. The more we move towards synchronicity, second-order cybernetics prevail, where communication goes in different directions: 1:1, 1: n, n: n (Zores, 2013; Piedra, 2011b). In this sense, the opportunities offered by these scenarios and their combination allow for a greater richness in the learning processes. Tools and means used enable different forms of interaction between the different participants in the pedagogical event: (a) students, (b) professors and teachers or tutors, (c) university centers and (d) producers and mediation designers.

All the training efforts are oriented to the first participant (the students); they ought to autonomous and self-manage their knowledge; other participants are responsible for institutional and academic aspects. Chairs and university centers have administrative functions, while teachers (or tutors) and producers and designers have functions that are more academic.

In asynchronous scenarios, these relationships are characterized by being vertical and unidirectional, while in synchronous scenarios, more horizontal and multi-choice relationships can be developed; it is even possible to offer design-learning activities where there is more interaction between students; participatory activities can be designed and the teacher or tutor can give more feedback. But these scenarios require a training process for teachers, so they can be used in the most beneficial way possible, promoting activities better adapted to Platforms.

As for learning assessment, the first scenario has an orientation towards product evaluation, while the second more towards processes. For this reason, for the first scenarios, we need to find forms of assessment, such as written tests, essays and research oriented to results; and in the second kind of scenarios, we need different ways of assessing learnings from heuristics, forums, projects, among other activities that require greater participation by students. However, this remains a transitive aspect between the traditional and constructivism

and dependent on knowledge that university teachers have about the training processes and their conceptions about learning.

In this sense, we can systematize this process as follows:

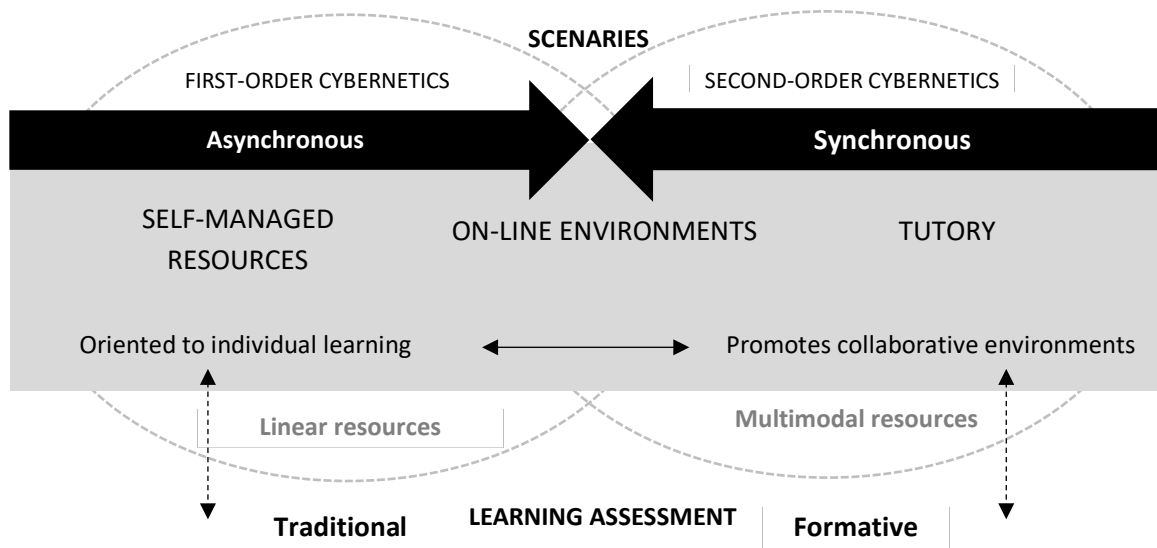


Figure 1: Learning environments in distance education. Adapted Mora (2016a).

As we see the third scenario, it is about what more complex training processes could be proposed and what teaching strategies, which require greater participation and interaction by students, can be devised.

On learning assessment, it should be noted that platforms favor co-assessment and self-assessment, which, although they are forms of evaluation that require students initiative, virtual platforms also allow for self-checks, peer feedback about the process and evaluation of aspects related to social and collective working skills. In this sense, the activities that initially promote linear cooperation can be promoted until students reach a more complex level of cooperation, where their actions complement those of others' and help build community knowledge through collective problem-solving activities.

Although university training tends to virtualization, we still have a labor market that requires people to work in a social sphere, develop leadership skills but who, in many cases, do not know how to lead multidisciplinary, inter- and transdisciplinary work teams.

On the other hand, it has been mentioned that teachers indisputably requires, not only technological skills, but also pedagogical knowledge (Piedra, 2014). Even when course are self-managed, students require a rigorous planning and foundation process so that the desired formative intentions are achieved and students develop knowledge with the level of depth that is expected of them. This implies a good curriculum, well designed, pedagogically and didactically.

#### 4. The foundation of cooperative, collaborative and participatory training processes

If we consider our theoretical perspective, university training should be based on the following assumptions:

- A cognitive subject embodied.
- Learning as a social process.

- Pedagogical models or approaches that consider the evolutionary and cultural processes of human beings.
- Learning environments that promote coexistence and the construction of joint knowledge.
- The development of teaching materials geared towards the ways human cognition and diversity of learning styles are formed.
- The role of the teacher in a course group, not as a mere reporter, exhibitor or poster of information. The role of a circumstantial alpha leader in a group is needed so the amount of overall learning in a group, motivation and interest do not declines.
- Distance education limited role of the teacher; today this is fundamental throughout the training process because teachers can have different roles, such as evaluator, tutor, developer of teaching materials, and mediator of virtual means of learning. Roles are more dynamic, although it also depends on the organization of academic group that promotes them.
- The internalization of learning contents runs through the mediation of training processes by teachers, which involves emotional processes, the theory of mind, social intelligence, and oriented and placed representations. In distance education, this process is core because most activities occur in asynchronous spaces, although digital technologies have promoted the use of synchronous spaces.
- The model assumes that students self-manage their learning so the mediation of the contents must be fundamental because of the type of resources that should be used.
- It is urgent that university training processes weigh aspects such as gender, gender differences and complementary, cultural variables, social interaction dynamics, differences in gender processing knowledge, the role of emotions, language and body.
- Most learning assessment models should emphasize the processes, not just the products. This, in addition to using assessment as a formative resource, allows the evaluation to contemplate aspects such as cooperation and collective work.
- Forms of communication that simulate social environments to be enriched by feedback are required, as well as the development of teaching materials that enable critical and analytical thinking. When working with a social participation methodology, you can have different perspectives and views.

In distance education, this is one of the great challenges, thus the importance of promoting research on educational foundations and approaching them from various dimensions and areas of knowledge (Mora, 2016b; Piedra, 2014).

Due to the nature of the model and the transformations that are being part of the development and the use of greater virtual resources, research on university distance education , more than ever is essential to improve training processes, and enable them to achieve the professional and human training of students who respond to social needs and have the necessary skills to cope.

## **5. Final comments**

Distance education invites us to navigate different scenarios. This implies that the challenges faced by teachers working in this model are many, as we have seen. More research is, then, required both basic and applied, so that we can build a responsible base for the training processes, but, at the same time, we must look for appropriate solutions for the processes of change and adaptation that are also demanded. This is also a model that requires greater planning and awareness of its formative intentions; therefore, it is not an issue that we should take for granted.

Finally, we cannot talk about education, training, teaching and learning without understanding how human beings build knowledge. Research methodologies are required to seek for multi-causal and multidimensional explanations. To understand human cognition, you cannot isolate yourself from other human dimensions; they are all co-articulated.

## 6. References

- Arce, M. (2008). Análisis de tropa y análisis literario: una aproximación al NIBELUNGENLIED. *Kañina, Revista de Artes y Letras*, 32(2), 109-122.
- Arce, M.A. (2017). Comunicación, lenguaje, teoría del lenguaje. In A.M. Mora (Ed). *Memoria Humana: lenguaje, representaciones mentales, memoria, emoción, cultura, conocimiento y educación*, (pp. 7-18). San José: PROFED-EUNED.
- Cartín, J. (In Press), *Emoción, sociabilidad y lenguaje: Propuesta de un modelo cognoscitivo de las emociones en su dimensión social*. Costa Rica: PROFED-EUNED.
- D'Alton, C. (2005). *El origen del lenguaje*. Tesis de Maestría. Universidad de Costa Rica: Costa Rica.
- Donald; M. (1991), *Origins of the Modern Mind: Three Stages in the Evolution of Culture and Cognition*. Cambridge, MA: Harvard UP.
- Geary, D. C. (2004). Evolution and cognitive development. In R. Burgess & K. MacDonald (Eds.), *Evolutionary perspectives on human development* (pp. 99–133). Thousand Oaks, CA: Sage Publications.
- Geary, D. C. (2005). Folk knowledge and academic learning. In B. J. Ellis & D. F. Bjorklund (Eds.), *Origins of the social mind*. (pp. 493–519). New York: Guilford Publications.
- Geary, D.C. (2011). Primal Brain in the Modern Classroom. *Scientific American Mind*, September, 44-49.
- Geary, David C. (2006). Evolutionary developmental psychology: Current status and future directions. *Developmental Review*, 26 (2): 113–119. doi:10.1016/j.dr.2006.02.005.
- Gibson, K. (2002). Evolution of Human Intelligence: the roles of brain size and mental construction. *Brain, Behavior, and Evolution*, 59, 10-20.
- Gutiérrez-Soto, M. & Piedra, L. (2014). *Habilidades de cooperación heterotécnica en estudiantes universitarios: bondades y desafíos*. Universidad de Costa Rica: Vicerrectoría de Docencia.
- Gutiérrez-Soto, M.V. & Piedra, L. (2015). *Los procesos de cooperación heterotécnica en el contexto de la docencia universitaria*. Universidad de Costa Rica.
- Huertas, J. y Montero, N. (2001), *La interacción en el Aula. Aprender con los demás*. Buenos Aires: Aique.
- Hung, D. W. L., & Chen, D.T. (2001), Situated Cognition, Vygotskian Thought and Learning from the Communities of Practice Perspective: Implications for the Design of Web-Based E-Learning. *Educational Media International*, 38 (1), 3-12.
- Maturana, H. (2001). *Emociones y lenguaje en la educación y la política*. España: Editorial Dolmen.

- Mora, A.M. (2016a). Los contextos de construcción de conocimiento en la Universidad Estatal a Distancia de Costa Rica. *I Congreso Latinoamericano de Investigación y Educación Superior Interdisciplinario*. Montevideo, Uruguay.
- Mora, A.M. (2016b). El estudio interdisciplinario de los procesos formativos en la Universidad Estatal a Distancia de Costa Rica: Aportes teóricos y metodológicos desde las ciencias cognitivas. *I Congreso Latinoamericano de Investigación y Educación Superior Interdisciplinario*. Montevideo, Uruguay.
- Mora, A.M. (2017). La función prospectiva de la memoria. In A.M. Mora (Ed). *Memoria Humana: lenguaje, representaciones mentales, memoria, emoción, cultura, conocimiento y educación*. (pp. 73-90). San José: PROFED-EUNED.
- Mora, A.M. (2018). Las concepciones sobre el lenguaje y su relación con los procesos cognitivos superiores, en docentes de I Ciclo y II Ciclo de Educación General Básica de escuelas públicas urbanas de tres cantones de la provincia de San José, Costa Rica. *Revista Educación*, 42(1), <https://dx.doi.org/10.15517/revedu.v42i1.19908>.
- Mora, A.M. (2015). La Cooperación heterotécnica y los procesos formativos universitarios. In: M. Gutiérrez-Soto, L. Piedra & A.M. Mora (Ed). *Ambientes promotores de la construcción del conocimiento en el contexto universitario*. (pp. 63-82). Costa Rica: Estación Experimental Fabio Baudrit-Departamento de Docencia Universitaria-Vicerrectoría de Investigación, Universidad de Costa Rica.
- Mora, A.M. (2013). *La naturaleza de la tropa prostética: un estudio empírico del comportamiento de un grupo Homo sapiens sapiens*. Tesis de Maestría. Universidad de Costa Rica.
- Orey, K. (2010). *Emerging perspectives on learning, teaching, and technology*. Switzerland: The global text project.
- Piedra, L. (2009). *Aprendizaje y enseñanza: implicaciones evolutivas en la docencia universitaria*. Costa Rica: Departamento de Docencia Universitaria. Universidad de Costa Rica.
- Piedra, L. (2011a). *El estudio de la memoria y sus implicaciones en los procesos de formación universitarios*. Costa Rica: Universidad Estatal a Distancia.
- Piedra, L. (2011a). El Constructivismo cibernético de segundo orden en la docencia universitaria. In M. Gutiérrez-Soto & L. Piedra (Ed). *Docencia Constructivista en la Universidad: una serie de ensayos sobre experiencias en Costa Rica*, (pp. 12-27). Costa Rica: Estación Experimental Fabio Baudrit-Departamento de Docencia Universitaria-Vicerrectoría de Investigación, Universidad de Costa Rica.
- Piedra, L. (2013). *Fundamentos Socio-Emocionales de los procesos formativos en el contexto universitario*. Costa Rica: Departamento de Docencia Universitaria - Escuela de Formación Docente - Universidad de Costa Rica.
- Piedra, L. (2014). *Fundamentos cognitivos y evolutivos de los procesos formativos en el contexto universitario*. Costa Rica: Departamento de Docencia Universitaria - Escuela de Formación Docente - Universidad de Costa Rica.
- Piedra, L. Mora, A.M. y Luetdke, K. (2013). *Modelos de cooperación en homo sapiens sapiens y cebus capucinos*. Costa Rica: Instituto de Investigaciones en Educación, Universidad de Costa Rica.

- Piedra, L., Cartín, J., Garita, R. y Barahona, M. (2010). *Informe final del proyecto de investigación La memoria: análisis y evaluación crítica de las teorías, modelos y enfoques actuales*. Costa Rica: Universidad Estatal a Distancia.
- Piedra, L.A. (2008). *La inteligencia maquiavélica y la educación superior*. Departamento de Docencia Universitaria, Universidad de Costa Rica.
- Piedra, L.A. y Mora, A.M. (2012). El estudio de la tropa prostética sus aportes a los procesos formativos. *Revista Reflexiones, Jornadas de Investigación Interdisciplinarias*, 45-53.
- Posner, M.I. & Rothbart, M.K. (2006). *Educating the Human Brain*. USA: American Psychological Association.
- Pozo, J. (2001). *Humana mente: El mundo, la conciencia y la carne*. Madrid: Morata.
- Reynolds, P. (1993). The complementation theory of language and tool use. In K. Gibson y T. Ingold (Eds.), *Tools, language and cognition in human evolution* (pp. 407-428). New York: Cambridge University Press.
- Rodríguez, W. (2018). Herramientas culturales y transformaciones mentales. Las tecnologías de la información y la comunicación en perspectiva histórico-cultural. *Actualidades Investigativas en Educación*, 18(2), <http://dx.doi.org/10.15517/aie.v18i2.33068>.
- Trigwell, K., Ellis, R. A., & Han, F. (2012). Relations between students' approaches to learning, experienced emotions and outcomes of learning. *Studies In Higher Education*, 37, 7, 811-824.
- Zores, W. (2013). *Pedagocibernética: aproximaciones iniciales a una nueva disciplina*. España-Portugal: Editores Unidos.



## Collaboration, communities and Open Education.

F.H.T. de Langen

Open University of the Netherlands

[Frank.deLangen@ou.nl](mailto:Frank.deLangen@ou.nl)

### Abstract

Sustainability of the organizational business model in open education is important for several reasons. Based on former research (de Langen, 2018) it is suggested that communities will play a major role in the survival of the supply of open education. In this paper we analyze a framework for success of communities, and compare this with the case studies in de Langen (2018).

### 1. Introduction: Why business models and open education?

Sustainability in Open Education is important for several reasons. Learners will appreciate courses which availability is guaranteed over a longer period. From the side of the policymaker and private subsidizers, sustainability is important to ensure that projects, websites and products survive after the initial subsidy stops. On the other side, teachers and others depend for their income on the survival of the organizations which provide both traditional and open education. Question we ask is "how can we set conditions which will stimulate the independent survival of open education?"

### 2. What models do we see in open education?

In de Langen (2018), we discussed three kinds of sustainable business models in Open Education. These models were:

- (1) Communities
  - (a). Merlot: a community driven by a central not-for-profit player, who stimulated communities, which contained both supply and demand. Merlot is financed through subsidies and fees for third parties, using the competences Merlot attained through its activities.
  - (b). FemTechNet: a distributed network, without a central player, where people produce Open educational materials because they need them; so supply and demand for OE coincide. FemTechNet survives because of the efforts of the participants and some subsidies from sympathizing organizations.
- (2) Platforms as OpenupEd: a central player providing a platform for different organizations of higher education supplying open materials, as MOOCs. The organization maintaining the platform provides guidelines for quality, production and delivery. OpenupEd finances its activities through fees from participating HEI's.
- (3) Commercial intermediaries (Lumen): In the case study, we analyzed an organization (Lumen Learning) which acts as an intermediary between the free general resources offered and the usage of these resources in a specific educational context. However, during the research we found that (especially in the Anglo-Saxon educational context, but also in other countries) there emerge for-profit organizations which derive their income by adjusting open materials for specialized SPOCs, or by changing traditional face-to-face education into distance online learning.

Some (American) MOOC-providers combine model two and three, by asking fees from organizations that offer their MOOCs through their platform and income from learners and third parties.

In this research, we will use insights of theories on collaboration from Open Innovation, and of Collaborate Learning to analyze the role of communities and group dynamics in the working of the first three models. Do factors as trust, interdependency, among others, influence the sustainability of OE-models? Moreover, if so (as we suspect), how can a community develop the right capabilities, organize itself to maximize effects; or can leadership play a role in long-term survival.

### 3. Models for collaboration and success factors.

Platforms, especially in the so-called sharing economy, connect actors in communities. Leung et al. (2019) define the sharing economy in different ways. We use the following: *an economic system in which an online platform connects the supply and demand sides to facilitate transactions of giving temporary access to idle resources* (p. 45). Using frame analysis, they develop an ecosystem framework, giving three strategies for success:

(a) Alignment to mutual interests: participants depend on each other and should not harm each other in pursuing their goals. The platform should provide a framework that enhances trust, privacy, security, income transfers, etc. as part of their business model.

(b) Collaboration for shared success: stakeholders as platforms, governments and customers should work together: Through collaboration, diverse interest groups, although having different individual goals, learn, adapt, and innovate together to form a dynamic and co-evolving sharing economy ecosystem (Leung et al., 2019, p. 51).

(c) Commitment to social responsibility: as the sharing economy has negative as positive outcomes, the interest groups should collaborate to stimulate an efficient use of resources, job creation and inclusion, minimizing discrimination, tax evasion theft, environmental issues and exploitation.

Yet, other kinds of OE take the form of collaboration between individuals in communities. Dalkir (2108) collected ten criterions of successful collaborations (figure 1). We will compare these success factors with the two community organized collaborations, mentioned in de Langen (2018).

Criterion	Description	Cases
History of cooperation	Already worked together	In FemTechNet and OpenUpEd members know each other and
Collaborative group is seen as legitimate leader in the community	Reputation is strong and credible	For example the central role of MERLOT
Favorable social and political climate	Opinion-leaders, political interests and funding agencies, support the mission	MERLOT and OpenupEd started with subsidies from state and private partners.
Mutual goals, trust and understanding	Share an understanding of each other organizations	Both in FemTechNet as MERLOT these are explicit goals of the leaders of the communities.

Appropriate cross-section of members	Each segment of the community is represented	OpenupEd has an homogenous membership, in MERLOT and FemTechNet it seems more diverse.
Members have a stake in process and outcome	Everyone has "ownership" of how the group works and produces.	Recognizable in all cases.
Flexibility and adaptability	All participants are open to working together, but also to changes when conditions change	A must in FemTechNet, but less obvious in centralized organizations as MERLOT and OpenupEd.
Develop clear roles and guidelines	Everyone understands their role, rights and responsibilities	The centralized organizations seem to have better developed standards compared with non-centralized communities.
Open and frequent communications	Interact often, update everyone, share information.	Seem to be the case in all cases.
Ensure sufficient resources	There must be sufficient resources and goals have to be realistic.	Merlot supports the community financially; in the case of FemTechNet and OpenupEd, the communities seek external support, sometimes adjusting the goals to the resources.

Figure 1: Ten criteria of successful collaboration.

Source: Dalkir (2018, p. 125).

#### 4. Conclusions and further research.

Most of the success factors of Dalkir (2018) are seen in the case studies in de Langen (2018). However, the case studies were not done with these frameworks in mind. Further research into these kinds of collaborations may be necessary.

Secondly, the success of organizations as Lumen Learning, intermediaries between the developers of different kinds of open education and the users (teachers or learners), show that there is a gap between those two groups. Communities as FemTechNet bridge this gap as the developers and the users are similar. In other cases, most of the developers of (open) education do develop educational materials based on their competences, ignoring the needs of the users.

Further research should study the ways and level of influence of learners and other users of educational materials in the development. For example, Arnstein's participation ladder (Arnstein, 1969, 2019).

## 5. Literature:

Arnstein, S.R., (2019) A Ladder of Citizen Participation, *Journal of the American Planning Association*, 85:1, 24-34, DOI: 10.1080/01944363.2018.1559388

Arnstein, S.R., (1969) "A Ladder of Citizen Participation," *Journal of the American Planning Association*, Vol. 35, No. 4, July 1969, pp. 216-224

Dalkir, K. (2018). Challenges in Online Collaboration: The Role of Shared Vision, Trust and Leadership Style. In *Online Collaboration and Communication in Contemporary Organizations* (pp. 118-138). IGI Global.

de Langen, F. (2018). Sustainability of Open Education Through Collaboration. *International Review of Research in Open and Distributed Learning*, 19(5). <https://doi.org/10.19173/irrodl.v19i5.3548>

Leung, X. Y., Xue, L., & Wen, H. (2019). Framing the sharing economy: Toward a sustainable ecosystem. *Tourism Management*, 71, 44-53.

## Collection of MOOC to create Digital programs

### Pierre ROLIN

IMT, France,  
Pierre.rolin@imt.fr

### Denis Moalic

IMT Atlantique, France,  
denis.moalic@imt-atlantique.fr

### Rémi Badonnel

Université de Lorraine, LORIA / INRIA, France  
[remi.badonnel@loria.fr](mailto:remi.badonnel@loria.fr)

### Olivier Berger

Télécom SudParis, France  
olivier.berger@telecom-sudparis.eu

### Jihane FOUZAI

Laboratoire BONHEURS, Université Cergy-Pontoise, France  
[jfouzai@gmail.com](mailto:jfouzai@gmail.com)

### Abstract

After the pioneering age, IMT is now entering the development and professionalization phase. The purpose of this paper is to present the development of a collection of MOOC in the area of Networks – Telecommunications, how those contents are designed and used in programs for students and professionals

The creation of a full on line degree, bachelor or master, requires the availability of a large number of courses, sharing similar rules of design (length, structure...) and consistent vocabulary. FLIRT1 project purposes were to create a collection of on line lectures in a common technical domain (telecommunications). This collection provides now a solid basis to create education programs either for initial education and lifelong learning context to experiment revenue generation from MOOC and business model [1]. This paper provides design rules, use cases and figures about first programs experimentation.

**Keywords:** lifelong learning, on-line education, mooc, spoc, telecommunication

### 1. IMT context

IMT (Institut Mines-Télécom), a network of French graduate engineering schools, is a public institution dedicated to higher education, research and innovation in engineering and digital technology. Always attentive to the economic world, IMT combines academic legitimacy with strong corporate relationships.

---

<sup>1</sup> Project supported by ANR program investissements d'avenir – FLIRT stands for Formations Libres et Innovantes dans les Réseaux et Télécoms – Free and Innovative Courses for Networks and Telecommunications)

Focusing on key transformations in digital technology, industry, energy and education, IMT trains the engineers, managers and PhDs who will play an active role in the major changes of the 21st century.

13,660 students are studying in Master of Science in Engineering, Master of Science, Master in Management, Executive MBA and PhD. IMT is strongly involved in the production of MOOC in French and English languages. Since 2013, 45 MOOCs have been produced and broadcasted mainly on 2 platforms: FUN (France Université Numérique) and EdX.org. Scientific domains covered by the MOOCs are Networks – Telecommunications (subject of this paper), Sciences for engineers, IT and programming and Digital, energy and industrial transitions.

MOOCs are a pillar of learning transformation at IMT in Graduate programs. MOOCs are currently used in the framework of core curricula in engineering and management courses.

Lifelong learning programs, mainly followed by professionals and job seekers, MOOCs are increasingly used by companies: they regularly use this kind of flexible training method to train staff members by recommending a MOOC or offering them as a SPOC (Small Private Online Course).

## **2. Producing a collection**

Networks and telecommunications fields are historical education domains of 5 IMT engineering schools for developing professional skills. Although MOOCs have a similar purpose as classical courses (acquiring knowledge and skills), pedagogy must be adapted to on line learning. FLIRT<sup>1</sup> project, funded by ANR<sup>2</sup> from 2016 to 2020, aims at developing a collection of contents, in the form of MOOC, so that consistent on line cursus can be proposed to students and professionals in lifelong learning can be evaluated.

### **2.1. Common pedagogical framework**

Firstly the project has designed a common pedagogical framework applicable to all MOOC produced. Each MOOC implements 3 on line activities to develop:

Knowledge: mainly based on video lectures to establish knowledge and quiz to enforce it and evaluate. Theoretical concepts are developed, vocabulary is defined and models (mathematical ...) are described and explained.

Practical application: the associated skills are developed through case studies applying knowledge to real cases. Learner has to apply his/her knowledge to solve a problem, evaluate a situation and propose a solution...

Know how: these skills development are based on labs to apply knowledge inside "equipment". Learner has to setup, configure and measure a described situation.

Professionals' skills are developed through the practical and know-how activities.

A general structure for each lecture has been defined has followed:

Duration or organization: 5 to 6 chapters (or week). A typical chapter (or week) consists in 4 to 7 lectures, a use case activity and an on line laboratory activity (e.g., simulation).

---

<sup>2</sup> Agence Nationale de la Recherche program Investissements d'avenir.



The student workload for the whole course activities is about 25 hours (around 5 hours per chapter) which roughly correspond to 1 ECTS (provided the student has the appropriate pre-requisites).

Each MOOC contains 2 sections common to all MOOC in the collection

First section: contains personal questions (who are you, motivations...) useful to analyse student expectations, personal presentation to other students in a dedicated forum, pedagogical team presentation, a prerequisite Quiz and recommendations about course organization, workload, skills targeted by the course ...

At the end a: "Your opinion" section queries about level of satisfaction and questions about skill level achievement before and after the course.

Most teachers implied in the project produced their very first on line lecture. The project also recommends the building of multi-teachers/schools teams. This has many advantages: less work-load for each teacher; benefit from teacher best expertise (practice) on each issue; content reuse by teachers in their traditional lectures and also increase teachers skills to on line education (production and use). As a consequence managing the pedagogical team and vocabulary consistency are two critical issues. Each MOOC has a scientific leader, managing the MOOC production and the support of a pedagogical engineer (mastering the platform and video production).

## **2.2. Common "edition" framework**

While different universities and partners are associated to produce MOOCs in the project, is it important to ensure consistency among MOOCs. Thus, several tools and processes have been set up, to guide and help MOOC producers in their way to develop MOOCs.

A production process and chart rules to guide teachers work have been produced. Charting rules are based on a PowerPoint framework defining a common look and feel, a MOOC logo and text size so as to be easy to read during video and how teacher video can be incrustated (Figure 1).

Look & feel is important has it signs visually the collection in each video. A graphical charter has also been develop and provided to video editors and teachers.

The PowerPoint model can be directly used by professor and given to the video production. It has been recommended that each video sequence stay below 7 minutes and focus on one or two concepts maximum.

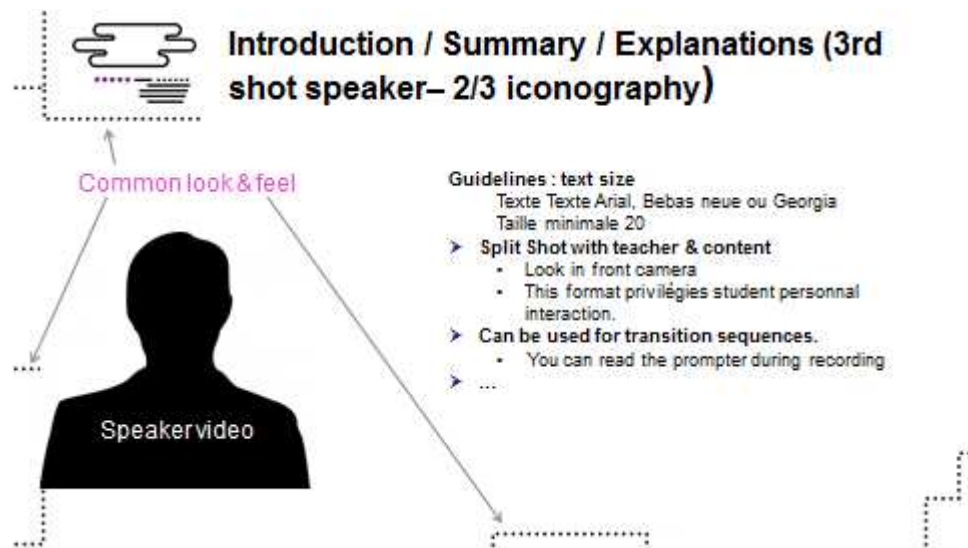


Figure 1 Recommendation example

### 3. Feed back to pedagogical team

A critical issue for professors in on line course is to know what learners are doing. Do they progress? Are they satisfied? Where do they spend time or get blocked? The forum provides a feeling about learners' difficulties but very few students are posting on the forum [2]. According to our experience this is less than 10% of active<sup>3</sup>students in public MOOC and barely used in SPOC. FLIRT project has developed tools to track and manage learners' progress and behaviour.

#### 3.1.Following students

MOOCpilot<sup>4</sup> tool, developed within the project, collects periodically course grades and present the result in graphical form [3].

The graph (Figure 2) represents the exercises' success rate. Columns represent exercises. One column contains all learners who completed this exercise. It is made up of several groups representing the learners' distribution based on their results (below 0.25, from 0.25 to 0.5, from 0.5 to 0.75, over 0.75). This provides information about where student have difficulties (grades below 50%) and how many have done each exercise (one exercise per column).

<sup>3</sup> An active or started student has got a grade in at least one graded exercise. There are usually much less active students than enrolled students.

<sup>4</sup> MOOCpilot is free software available on Github the development platform for open source.

### 3.1.1. Diligent learners evaluation

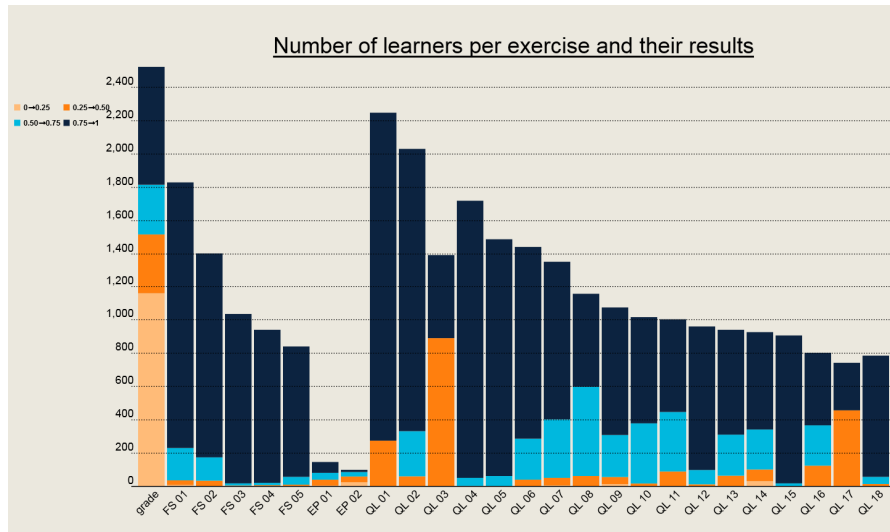


Figure 2 Students progress and results quality.

We define as “diligent learners” (one can also say assiduous) students that did the first graded exercise in week 2 and week 1 exercise(s). This criterion is useful as one knows that a strong proportion of learners drop out during the first week. The “diligent learners” proportion that complete the course, obtains the required global grade for success, is a significant MOOC quality indicator.

The graph (Figure 3) displays the number of learners performing each exercise, based on when they perform them. Lines give exercises’ name. Column Total give how many did exercises cited on line, columns C1, C2,... give grades collection date and how many did the exercises during period span (data collection date) C1-C2, C2-C3.... One bubble contains number of learners who completed this exercise. When browsing over each bubble, percentage enrolled students and active students<sup>5</sup> percentage are given. On Figure 3 the first graded exercise in week 2 is ES02 also reading bubble (Column Total, Line ES02) gives “diligent learners” number and percentage.

<sup>5</sup> An active or started student has got a grade in at least one graded exercise.

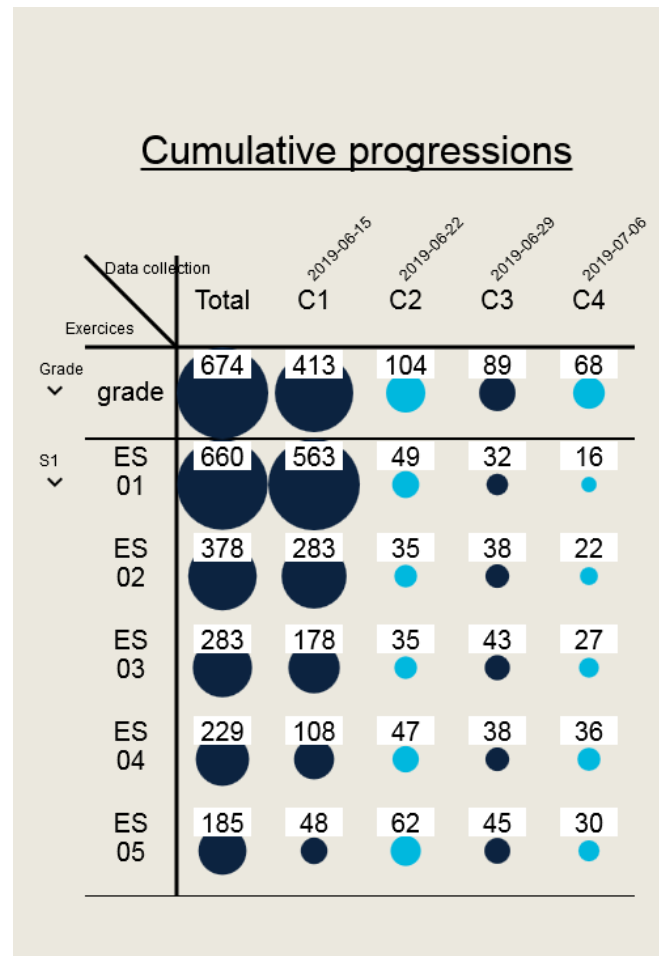


Figure 3 : Temporal progression also called cumulative

As an example on figure 3 above: for exercise "ES02"

- 378 learners took the exercise in total.
  - 283 of them took it before data collection date "C1" (i.e., 2019-06-15),
  - 35 of them took it between data collection date "C1" (i.e., 2019-06-15) and C2 (2019-06-22)
  - Etc.

MOOCpilot measures many other criteria, including forum performance (number of posts, unanswered questions, most active learners, etc.), individual progression, students list that did an exercise. Interested reader will find in [PLA18] more information's.

### 3.1.2. MOOC global evaluation

In order to compare different sessions of the same MOOC or different MOOC five indicators are followed (Figure 4). In a MOOC the enrolled learners' proportion that does a graded exercise, named started or active or students, in the MOOC is always low. In this example this was only 22% and those that continue after first week, diligent students, is even lower.

Successful students have a global grade higher than the threshold defined for the MOOC. Figure 3 can be computed with a threshold, then line grade provides directly successful students number and percentage.

Date	Course end	
<b>Enrolments</b>	10246	Including unregistered
<b>% started</b>	22 % 2248	Those that have responded to the first graded exercise (first Week)
<b>% diligent</b>	14 % 1443	Started that have responded to the first graded exercise in thesecond Week
<b>% success</b>	8,9 % 911	Those that have a global grade > successful rate required
<b>% diligent success</b>	63 % 911	Diligent that have a global grade > successful rate required

Figure 4: Common indicators followed

### 3.2.Skill achievement

The final QUIZ asks students to scale their perceived skills level mastering before and after the MOOC. Each student evaluates its personal skill level in the range [0, 10]. The Figure 5 shows students responses synthesis for MOOC PRD<sup>6</sup> session 8 (spring 2019). A graph shows response definition and an average is computed. MOOC PRD session 7 (Autumn 2019) is also given. One can observe that for two learners' population, temporally separated, average gain values are pretty close.

#### Skill 2 definition

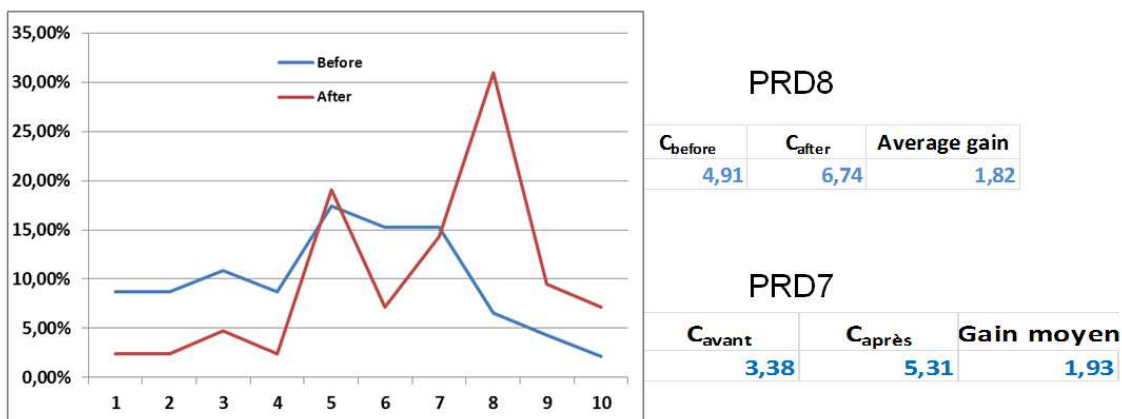


Figure 5: Skill 2 personal evaluation

<sup>6</sup> Principe des Réseaux de Données (Data Networks Essentials)

As an example for figure 5: for skill 2 targeted by the MOOC PRD8, skill mastering perceived by learners is

- 4,91 before taking the MOOC,
- 6,74 after the MOOC,
- Meaning a gain of 1,82 points out of 10.

#### 4. Building cursus

FLIRT project includes more than 10 courses (Figure 6) covering partially the scientific domain (networks and telecoms). They are used to:

- propose to students (initial learners) partial or complete degree,
- answer to lifelong learning demands.

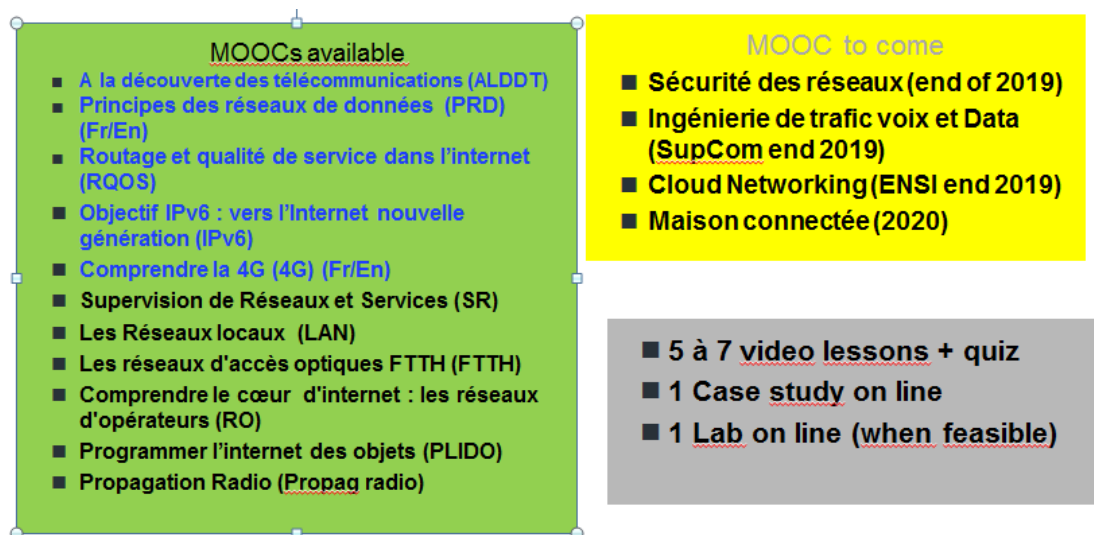


Figure 6 MOOCs list, MOOC abbreviations names used inside this paper are enclosed by ()

The course structure described in paragraph 2.1 provides valuable arguments to propose to learners either on line free access to knowledge or paid access to professional skills associated to a certificate delivery. For example, MOOC can propose a free access for video lectures and quizzes, while premium members can access case studies, labs and simulators

#### 4.1. Standalone MOOC

##### 4.1.1. Free MOOC sessions

Most MOOC have been broadcasted publically on FUN in French language. Pubic is 55% in France and 40 % in Africa (French speaking countries). We have observed that for the networks and telecoms domain, more than 60 % of enrolled learners are professional occupying a position. Among which 50% work in large companies and 50% in small or middle companies. The motivations expressed by these two groups are significantly different.

Large companies learners wish to obtain a better position, change of category. SMEs and PMEs learners explain that they anticipate evolution business and want to keep their skills up to date.



A comparison of different MOOC (Figure 7) exhibits significant differences according to pre-requisites level but the MOOC broadcasting period merits more attention. One can observe that in average 14.4% enrolled student begins, 65% of started becomes diligent. The diligent success rate is high 67.9%. Weak diligent success rate are typical of MOOCs difficulty. PRD requires a lot of work (6 to 7 hours per week), Propag-Radio assumes very good knowledge in Physic and targets master degree students also many enrolled may have abandoned after pre-requisite quiz. Even when difficulty and pre-requisite are clearly presented in the MOOC description many learners enrolled.

MOOC name	Average	PRD_6	RO	FTTH	Propag radio	SR_1	SR-2	LAN_1	LAN_2
Targeted audience		pre Bachelor	Bachelor	pre Bachelor	post Bachelor	Bachelor	Bachelor	MOOC PRD	MOOC PRD
Enrolled		<b>7267</b>	<b>10246</b>	<b>6250</b>	<b>4325</b>	<b>6352</b>	<b>6080</b>	<b>8313</b>	<b>5774</b>
% started	<b>14,4%</b>	12,9%	22,0%	30,3%	6,0%	8,3%	8,4%	18,9%	8,5%
% diligent	<b>9,3%</b>	7,8%	14,0%	18,6%	2,8%	7,4%	7,2%	12,6%	4,3%
% success	<b>6,5%</b>	3,9%	8,9%	15,3%	1,1%	6,2%	5,7%	7,8%	3,4%
% diligent success	<b>67,9%</b>	49,4%	63,0%	84,9%	40,0%	85,0%	79,0%	62,0%	79,5%

Figure 7 Multi MOOC of the collection comparison

The average global perceived gain is 2 (Figure 8). The MOOC FTTH being an exception as student's prerequisite knowledge on the topic is low. MOOC Propag-Radio, even complex, achieves the second best gain.

	Average	PRD_6	PRD_7	PRD_8	RO	FTTH	Propag radio	SR_1	SR-2	LAN_1
		pre Bachelor	pre Bachelor	pre Bachelor	MOOC PRD	pre Bachelor	post Bachelor	Bachelor	Bachelor	MOOC PRD
Skill gain	2,46	2,38	1,71	1,78	2,02	5,35	2,68	2,11	2,30	1,81
Estimation before	4,46	3,92	3,91	4,17	5,53	2,68	5,35	4,61	4,54	5,43
Estimation after	6,92	6,30	5,62	5,95	7,55	8,03	8,03	6,72	6,84	7,24

Figure 8 Skill gain comparison

Collection impact on enrolment is important. A communication for each new MOOC (or MOOC session) is made to all enrolled students of other MOOCs in the collection. Important enrolment peaks are clearly and immediately visible.

We also measure dual enrolment in the MOOC of the collection. Figure 9 shows dual enrolment figures for MOOC RO session 1 (more than 10 000 enrolment see Figure 7). The closer is the previous MOOC session, the more students enrol. On Figure 9 FTTH was 3 month before RO session. LAN and SR finished 6 month before. PRD6 took place one year before and more for PRD5

PRD5	PRD6	LAN	SR	FTTH
<b>1239</b>	<b>1329</b>	<b>1929</b>	<b>1768</b>	<b>2465</b>
<b>12%</b>	<b>13%</b>	<b>19%</b>	<b>17%</b>	<b>24%</b>

Figure 9 : Collection impact on enrolments, proportion of dual enrolments.

#### 4.1.2. Certificate

The project has experimented on MOOC PRD (session 7 and 8) a freemium/premium [4, 5] proposal:

- DISCOVERY: free but provide access to reduce content, merely the theoretical contents.

- QUALIFYING: providing access to all content: knowledge, use and know how (as defined in parag 2.1), additional contents, on line bas (see parag 4) plus a proctored exam to obtain an IMT certificate. The price is 150€.

Qualifying Formula	Session 8	Sesion 7
Percentage of enrolled learners taking the « qualifing » offer”.	0,4%	0,5%
% started	100%	80%
% diligent	80%	63%
% diligent certified	56%	70%
% certified	45%	44%

Figure 10 : Observed results in formula QUALIFYING

Figure 10 shows that surprisingly there is still a learner’s proportion that does not even start while paying for additional content. Diligent proportion is much higher than in public MOOC (see Figure 7). And only 45% of them obtained the certificate, this is much less than in a classical teaching. Some learners did achieve a pretty good grade in the MOOC but did not make the proctored exam. Queried by mail all explained that they were not feeling self-confident. Achieving student self-confidence appears an on line course weakness. In a classroom, direct contact with other students and a teacher builds a better self-confidence. On line students work alone and barely use the forums to get help, even when they pay the course.

One can also observe on Figure 8 that from PRD6 (session 6) to PRD7 (session 7) the skill gain decreases. This corresponds to the fact that in PRD6 all students had access to the whole content (equivalent to QUALIFYING formula) while in PRD7 most had only access to DISCOVERY content. Self-skill evaluation appears consistent with accessible content reduction.

#### 4.2.MOOC Programs

IMT offers several MOOC programs for developing skills step by step. IMT MOOCs are proposed in session mode (as opposed at self-paced or always available). These enables to provide support limited in time (teaching assistant during the session) and to control forum (avoid illegal usage). The drawback is that learners must do all the work during the session.

##### 4.2.1. Networks MOOC program on FUN

A three MOOCs sequence in the domain “networks and telecommunication” has been planned so that learners can follow MOOC AALDT (January –February) then MOOC PRD (March –April) and then MOOC RQOS (May-June) Communication has been made on the sequence as a whole and not MOOC by MOOC. One can observe on Figure 11 that the common enrolment proportion is important and higher than observed on Figure 9. 15% have enrolled in the three MOOC.

	ALDDT	PRD8	RQOS6
<b>NB enrolled</b>	3364	3961	3671
<b>Nb enrolled common to ALDT and</b>	<b>3364</b>	<b>1226</b>	<b>568</b>
<b>% common enrolled</b>	<b>100%</b>	<b>31%</b>	<b>15%</b>

Figure 11 Common enrolments in sequenced MOOC sessions

But if we look on Figure 12 "started" results are more disappointing. There is no obvious proof of student commonly started 2 MOOC increase. The proportion of starting student decreases from first MOOC to second and third. A possible explanation is that the broadcasting period is probably the most important criteria upon student availability to perform MOOC activities.

	ALDDT	PRD8	RQOS6
<b>NB started</b>	1112	867	445
<b>% started</b>	33%	22%	12%
<b>Nb started common to ALDT and</b>	<b>1112</b>	<b>194</b>	<b>40</b>
<b>% started common</b>	<b>100%</b>	<b>17%</b>	<b>4%</b>

Figure 12: Analysis of started

#### 4.2.2. "Networks basics" program with certificate

The program "Networks basics" composed of 4 on line courses (ALDDT, PRD, LAN and FTTH see Figure 6) is proposed with "Ecole Supérieure Polytechnique" (ESP) Dakar Senegal for 100 000 Fcfa (paid at ESP). Successful students obtain an IMT-ESP certificate. Student workload is evaluated to 150 hours. The program duration is one semester. It is planned to propose the program twice a year, for autumn semester and spring semester. It is Implemented as 4 SPOC (ie, not public MOOCs) on FUN campus platform.

Communication is made in newspapers and radio. ESP has enrolled 75 students in 2019 session. SPOCs were sequentially opened, one every month and remain opened until the end of the program. Weekly mail was sent to students in order to maintain their attention. Teaching assistants were available to answer to students questions but they had nearly no question on the forum.

Teaching assistants are quite passive and only react when triggered by learners. Conclusion is that teaching assistant should be more proactive as community managers and coaches to enhanced learners' interaction, sense of community and motivation.

Most students had difficulties to work regularly and the majority is quickly getting behind schedule. Finally only 14 students among 75 got the certificate.

#### 4.3. Lifelong learning - Blended programs [6] – Hybrid MOOC<sup>7</sup>

Encouraged by observation about public MOOC professional audience (cf. parag 4.1.1) multiple marketing approaches have been experimented during the project by IMT lifelong learning service (Telecom Evolution TeV).

The initial business model was to sell programs based on several MOOCs associated with labs in physical spaces with IMT's equipment and a certificate. It appeared that 100 to 150 hours programs do not respond market expectations: they are too heavy for companies and professionals who prefer

short and modular trunks. Shorter modules have been set up such as a single course (SPOC) associated with a learner progress survey available to manager, a teaching assistant to answer to learners questions. An administrative person to enrolls learner and responds to technical issues (questions related to the platform). A dedicated platform that provides a completion process (learner must do sequentially the course) has been used. Even if this proposal got a very good feedback when proposed to companies the number of real customers remains low. The use of forum is also quite inexistent also it not worthwhile to pay for a learning assistant during a session if they act only in "reactive mode" and not as coaches. When a question related to the content and needing an expert appears, the administrative person relays it to a teacher. Learners' feedback was very positive but they expressed demands for hands on activities in physical workshops.

Also new offering are merely hybrid [8]. A one or two days session for practical activities (Lab, case studies) is proposed after the on line course.

Some courses are deployed in hybrid mode, mixing on line activities (mainly theoretical) in the form of MOOC or SPOC and hands on activities in physical spaces, such as labs.

Results are very encouraging in terms of

- Meeting market needs
- Revenue generation in a commercial approach
- Skill acquisition for learners
- Learners' satisfaction

As an example, a hybrid course on Internet of Thing has been deployed for professionals in march 2019.

Course was deployed during 3 days, mixing online activities and hands on activities in workshops.

13 trainees bought this course (1 900€).

100% were certified (based on online evaluation and workshop production)

- 100% were satisfied (35% very satisfied and 65 satisfied)

Feedback from learners was very positive

- They much appreciated the hybrid format – learn at their own pace, autonomy in their learning, flexibility to pick up areas of interest
- They appreciated the mix between theory and hands on activities, in group

Difficulties identified:

- As learners are progressing at different speeds, it is difficult to synchronize the whole group (e.g., sum up a chapter while some have finished long time ago and other not)
- For the same reason, difficulties to perform work in group

- Additional costs for blending the courses needed to
  - resources needed to manage on line content and access as compared to a traditional face to face training
  - resources needed to perform the workshops as compared to a 100% on line course

While online content is provided teacher is more focused on providing additional explanations, answering questions and supporting the hands on activities.

From a business model point of view, while the hybrid format seems to answer market and learners' expectations, the cost is the main issue as on line training is often perceived as a mean to decrease cost while in reality blended learning is more costly than 100% face to face or online training.<sup>9</sup>

## 5. On line Labs activities

MOOCs and SPOCs of the collection include labs using simulators to be installed on the learners' computer. This raises multiple difficulties.

- Simulators works only on computers. This eliminates learners on Mobile phone and tablets.
- Simulator installation is only possible by learners that administrate personally their computer. This is not the case in many companies.
- Installation requires computer science skills that are outside the prerequisite of the course. Very often installation errors or parameters settings build incorrect lab configuration.
- Some computers are not powerful enough to support the simulators (slow CPU, not enough memory...).
- Teachers must provide installation description and files for the different existing computers and operating systems (Macintosh, PC, Unix, Linux...). Providing a virtual machine to be installed may make this simpler but files to upload are huge. These issues represent nearly 30% of the post in the forum.
- There is no way to observe learner progress or behaviour during their lab activity. Answers to quizzes are proposed in the course but any mistake in lab configuration by student leads to erroneous answer. Helping student need screens copy on the forum, and many interactions.

Consequently a significant effort has been made by the project to provide on line lab [10, 11] access (simulators hosted on a remote server in the Cloud) specifically to allow professional learners to perform lab from their company and to avoid students to have to master computer sciences skills. Solution developed by Procan company (FLIRT project partner) is to perform lab hosted in a Cloud server with all interaction in a learner browser screen. Teachers configure once the virtual machine in the cloud so those learners don't have to do it. Learners have just to click on a link inside the course to access the lab environment in a browser window. This solution is accepted by most company firewall.

Virtual machine inside the cloud is not free, so this solution can be used only with the QUALIFYING formula described in parag 4.1.2. to cover this cost.

This solution significantly reduces teaching assistant support. The VM in the cloud is selected so as to be enough powerful so that lab environment is more convenient.

With this solution, teachers can see what is done in real time by learners. This opens an opportunity to enrich commercial offering.

## 6. Conclusion

Course collection availability opens the opportunity to propose coherent learning programs and experiment lifelong learning offering and business model.

## References:

---

- 1 Epelboin, Y. (2017). MOOCs: a viable business model?. In *Open Education: from OERs to MOOCs* (pp. 241-259). Springer, Berlin, Heidelberg.
- 2 Onah, D. F., Sinclair, J. E., & Boyatt, R. (2014, November). Exploring the use of MOOC discussion forums. In *Proceedings of London International Conference on Education* (pp. 1-4).
- 3 Michel Plantié, Michel Crampes, Mooc pilot: Mooc analytics, students learners automatic Follow-up analytics, OpenEdx forum 2018, Montréal , Canada, may 2016
- 4 Kumar, V. (2014). Making" freemium" work. *Harvard business review*, 92(5), 27-29.
- 5 Wilson, F. (2006). The freemium business model. *A VC Blog*, March, 23, 201.
- 6 C. Kloos, C. D., Muñoz-Merino, P. J., Alario-Hoyos, C., Ayres, I. E., & Fernández-Panadero, C. (2015, March). Mixing and blending MOOC Technologies with face-to-face pedagogies. In *2015 IEEE Global Engineering Education Conference (EDUCON)* (pp. 967-971). IEEE.
- 7 Hamonic, E., Hopma, A., Gaultier, B., & Moalic, D. Teaching Digital Manufacturing Experimenting Blended-Learning Models By Combining MOOC And On-site Workshops In FabLabs. Madrid, may 2018. Available on [http://educate.gast.it.uc3m.es/wp-content/uploads/2018/06/HybridEd\\_2018\\_paper\\_7.pdf](http://educate.gast.it.uc3m.es/wp-content/uploads/2018/06/HybridEd_2018_paper_7.pdf) (checked 23/08/2019)
- 8 Pérez-Sanagustín, M., Hilliger, I., Alario-Hoyos, C., Kloos, C. D., & Rayyan, S. (2017). H-MOOC framework: reusing MOOCs for hybrid education. *Journal of Computing in Higher Education*, 29(1), 47-64.
- 9 Denis Moalic, Baptiste Gaultier, « Using MOOC for hybrid learning in lifelong learning context and business model experiment”, june 2019,. Cambridge, MA, USA, Available on [https://web.mit.edu/mitxbio/img/LINC\\_Workshop\\_2019\\_paper\\_2.pdf](https://web.mit.edu/mitxbio/img/LINC_Workshop_2019_paper_2.pdf)
- 10 BERGER, Olivier, A review of Virtual Labs virtualization solutions for MOOCs}, Telecom SudParis Technical Report 2018, available on <https://hal-imt.archives-ouvertes.fr/hal-01705686/file/virtual-labs-memo-flirt.pdf>
- 11 Olivier Berger, J. Paul Gibson, Claire Lecocq, Christian Bac Designing a Virtual Laboratory for a Relational Database MOOC, *Proceedings of the 7th International Conference on Computer Supported Education - Volume 1: CSEDU*, 260-268, 2015, Lisbon, Portugal





## Connecting educational resources to "all in one" distance learning and teaching: the CANVAS pilot project

### Maria Teresa Bendito Cañizares

Universidad Nacional de Educación a Distancia (UNED)  
mtbendito@der.uned.es

### Ana Garcia-Serrano

Universidad Nacional de Educación a Distancia (UNED)  
agarcia@lsi.uned.es

### Francisco Javier Sanchez Botas

Desarrollador INTECCA (UNED)  
fjsanchez@intecca.uned.es

### Abstract

The distance learning community has reached a sufficient level of maturity to integrate disjointed multimedia information (educational resources) to facilitate student use in specific subjects. There are two basic aspects to consider, the methodology that permits the integration of these resources and the production of enriched electronic books (EEB), beyond those that only allow browsing, annotating or external consultation.

At the UNED we have the "UNED Code of conduct" with the sub-code to produce didactic materials<sup>1</sup>, different protocols to evaluate the didactic quality of materials (IUED<sup>2</sup>), different production services like the CEMAV<sup>3</sup>, INTECCA<sup>4</sup>, UNIDIS<sup>5</sup> and the Editorial. Once the teachers have the official consent of their faculty to publish a book on a subject included in an official degree, the production of the book and the publication flow starts. However, these isolated UNED services must be coordinated to produce on EEB that satisfies the authors, the students learning needs and the accessibility requirements for students with different capabilities (currently, more than 50% of disabled Spanish university students are enrolled at the UNED).

This article presents CANVAS, a pilot project developed at the UNED in 2018 to explore and coordinate the production of an EEB on a law subject "Derechos reales e inmobiliario registral" (Real Estate and Registry law), which combines the educational resources needed, thus providing a comprehensive, versatile, customized, easy to update and all in one learning and teaching method with M.T. Bendito as the author and A. Garcia-Serrano as the leader of the production pilot project.

**Keywords:** e-book, educational resources, support services in online and distance education, enriched electronic book, integrated methodology, CANVAS methodology, scenario methodology.

---

<sup>1</sup> [https://descargas.uned.es/publico/pdf/respsoc/SUBCODIGO\\_DE\\_CONDUCTA\\_SOBRE\\_MATERIALES\\_DIDACTICOS.pdf](https://descargas.uned.es/publico/pdf/respsoc/SUBCODIGO_DE_CONDUCTA_SOBRE_MATERIALES_DIDACTICOS.pdf)

<sup>2</sup> [http://www2.uned.es/iued/subsitio/MADI/Protocolo\\_IUED\\_Revision\\_Guias\\_CG\\_24042018.pdf](http://www2.uned.es/iued/subsitio/MADI/Protocolo_IUED_Revision_Guias_CG_24042018.pdf)

<sup>3</sup> <https://www.uned.es/universidad/inicio/institucional/cemav.html>

<sup>4</sup> <https://www.intecca.uned.es/inteccainfo/>

<sup>5</sup> [http://portal.uned.es/portal/page?\\_pageid=93,154331&\\_dad=portal&\\_schema=PORTAL](http://portal.uned.es/portal/page?_pageid=93,154331&_dad=portal&_schema=PORTAL)

## 1. Introduction

The UNED (Universidad Nacional de Educación a Distancia) is the Spanish public University for Distance Learning accepting and adopting most of the technical and methodological challenges that its huge number of students have benefited from over for the year past. One of the most interesting goals is to provide the students with educational resources for the degrees offered. The material described in this paper, was proposed by the first author, coordinator of the subject "Civil Law III: Real Estate and Registry Law" (Canvas-civil Law III or EEB) of the UNED degree studies in Law and its edition was approved by the Council of the Department of Civil Law of the Faculty of Law (on April 18, 2018), framed in the CANVAS pilot project addressed by the Vice-rectorate of methodology and innovation (Navio et al, 2018) in accordance with "Strategic Orientations of the UNED" approved in December, 2017).

Educational materials must meet different guidelines to facilitate the innovative, singular, homologated and equal production in distance education for all students, thereby complying with the regulations applicable at our University, mainly the Code of Conduct for teaching materials<sup>6</sup> ("Subcódigo de Conducta para los materiales didácticos" SCDCMD, approved by the UNED Governing Council on October 26, 2011). The focus of interest of the CANVAS pilot project in producing an enriched e-book is consistent with what is stated in the SCDCMD:

- (4th para. Preamble) "... make available to the university community educational content in all media, including those that allow information and communication technologies."
- (art. 2) "... the UNED must be inspired by its edition of materials in a series of criteria... Establish measures that minimize the environmental impact of the editing activities of teaching materials, tending to increase the use of digital media or any other more environmentally friendly".

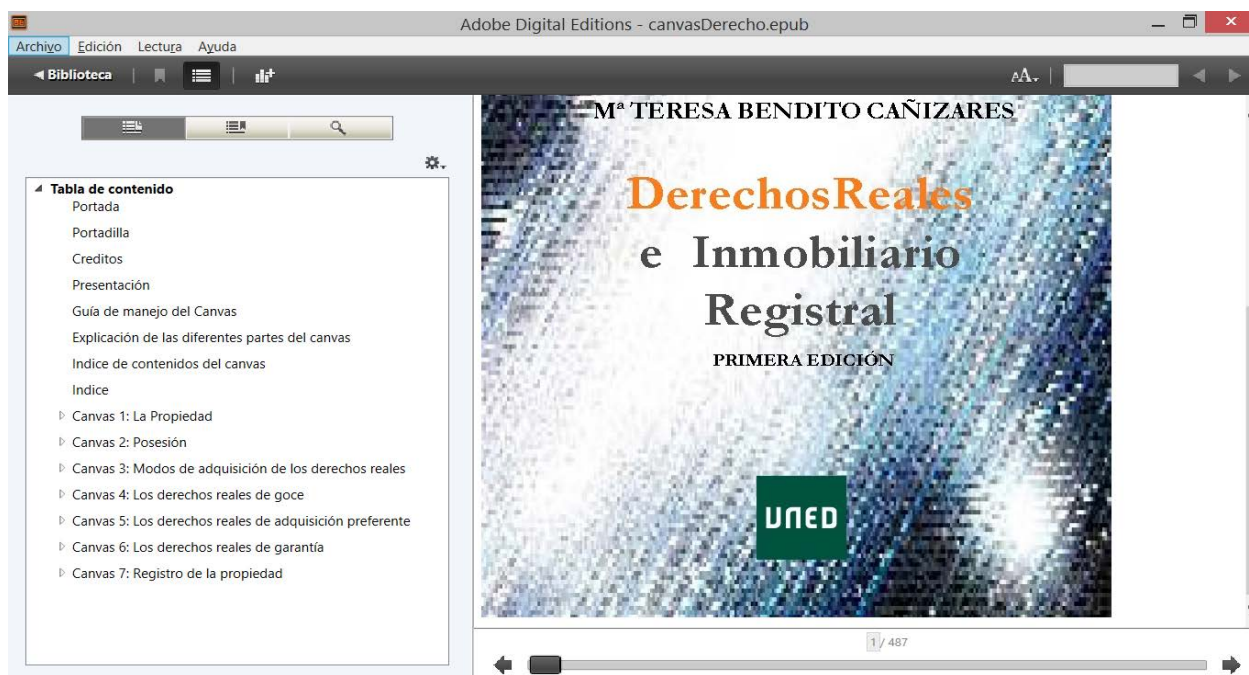


Figure 1: CANVAS e-pub frontpage.

<sup>6</sup> [https://descargas.uned.es/publico/pdf/respsoc/SUBCODIGO\\_DE\\_CONDUCTA\\_SOBRE\\_MATERIALES\\_DIDACTICOS.pdf](https://descargas.uned.es/publico/pdf/respsoc/SUBCODIGO_DE_CONDUCTA_SOBRE_MATERIALES_DIDACTICOS.pdf)

In line with the commitments undertaken in our regulations mentioned above, there are two academic reasons leading to the development of CANVAS: first, the difficulty of the subject; it is squeezed into a semester although it is an extensive and complex subject; the second reason concerning the previous author's experience in serious games; it is another way of learning and teaching already familiar among students: paper, epub and Apps<sup>7</sup>, in the UNED-radio Competition because it has been running for eleven years; this model of learning and teaching was presented in a EADTU Web-meeting on "Content gamification, digital narratives and transmedia (ICT & EDUCATIONAL SUPPORT/MEDIA SUPPORTS SERVICES) April 22<sup>th</sup>, 2016.

Two different but complementary methodologies are brought together under the heading 'CANVAS: Derechos Reales e Inmobiliario Registral '(Real Estate and Registry Law): CANVAS methodology itself o neuronal CANVAS system and SCENARIO methodology.

### 1. CANVAS methodology: neuronal system

The methodology that this new material uses we have so-called "CANVAS", because it gives learning elasticity as if it were a blank canvas.

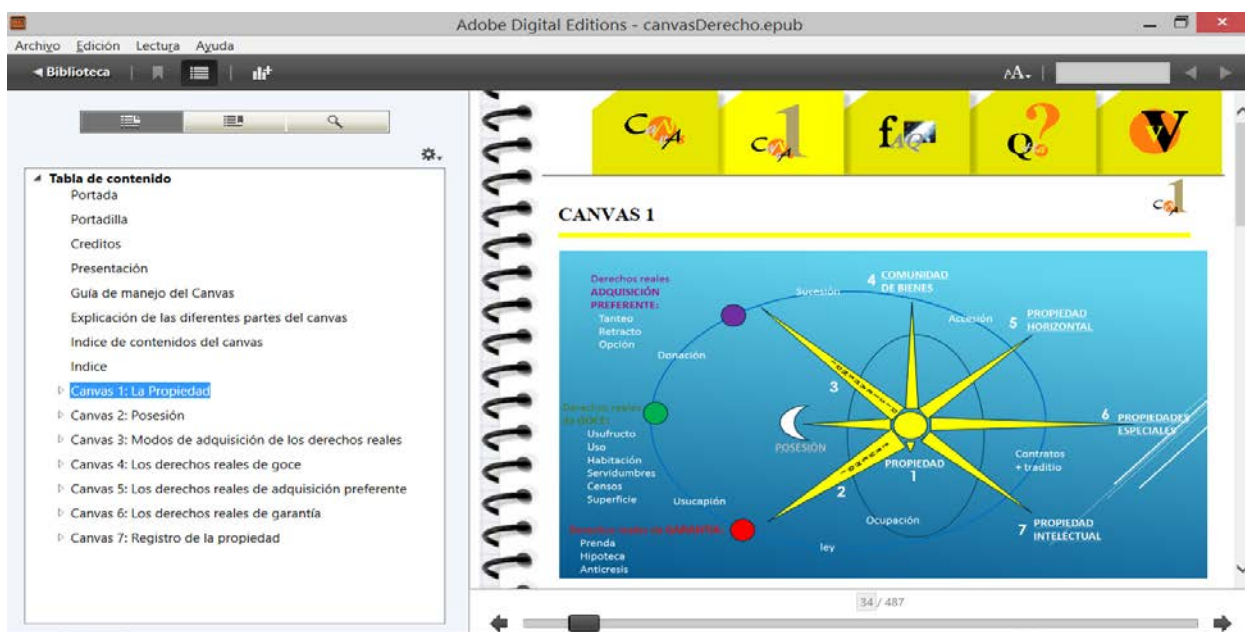


Figure 2: CANVAS chapter starting page showing methodological components.

The structure of CANVAS is in itself part of its own didactic methodology and provides a different type of learning experience for students. It could be summarised as follows: the book is made up of seven CANVASSES and the same four folders are maintained throughout. Above the summary-table where the student can study the basic information on this CANVAS (e.g. in CANVAS 6, mainly mortgage), there are three more folders called: ¿Qué hemos aprendido? (QHA), Preguntas y respuestas más frecuentes (FAQ) and Varios (VV). The first one asks students they have learned from the summary-table but with humour and a lot of tests and other techniques for retention of knowledge by which they can do a self-assessment of their level of study.

<sup>7</sup> <https://itunes.apple.com/es/app/juegos-juridicos/id533824740?mt=8> (not available).

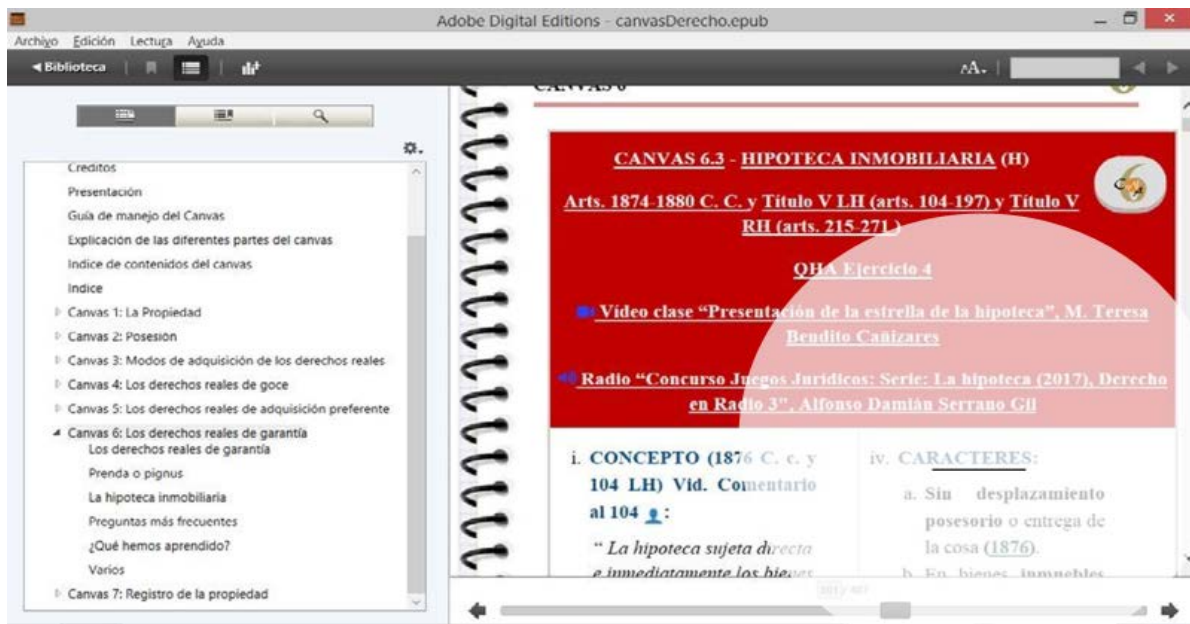


Figure 3: CANVAS summary table on mortgage showing methodological components (videos, Radio Competition and other different internal and external links, QHA...)

FAQ, as its name implies, is the folder that includes questions and answers concerning the matter developed in the summary table. Added value is explained in another way (usually in other words), students' concerns or issues repeated over the years in forums. Therefore, the FAQs will complement the subject matter with the explanation of those questions most frequently raised in the forums by students. Sometimes, the explanations, answers are resolved by students and if so, habitual roles are swapped. This type of ebook implies a new way of learning and teaching could involve role changes.

Finally, the VV folder is intended for mass information, extra information like a jurisprudence, comments, articles and so on.

The appearance of the e-pub body, formed by "summary tables" and folders of the contents of the program of the subject, would not do it justice, since, unlike these, the canvasses do not have a closed spirit. On the contrary, the characteristic that best defines a CANVAS is **its open and mobile character**; It is a living material that allows and will allow teachers to design on it to offer the student the best teaching picture that would undoubtedly be the most up-to-date and in line with the extra-academic reality from which it feeds. Bringing precisely to this extra-academic reality, in other words, the social and legal reality of the moment in which the subject is taken, with openness and with the spirit of a global tool or of "all in one" is the innovation that offers a canvas offers.

As mentioned, the particularity of the canvas is that they are **open tools**, so that the multimedia that are included at the beginning of each part developed in the CANVAS, contextualizes the subject and the part on which they are focused, so that the student can approach the study of the subject from the best starting position.

Like the brain, the EEB has so **many connections** within its seven CANVASSES and with external links (for instance, different webs, documents, class video-room, questions...). Hyperlinks to legislative texts and jurisprudence facilitate, when incorporated into a single document, the understanding of the subject without

the distractions produced by the consultation of Codes or other special laws that in the case of Civil Law III, are abundant and changing.

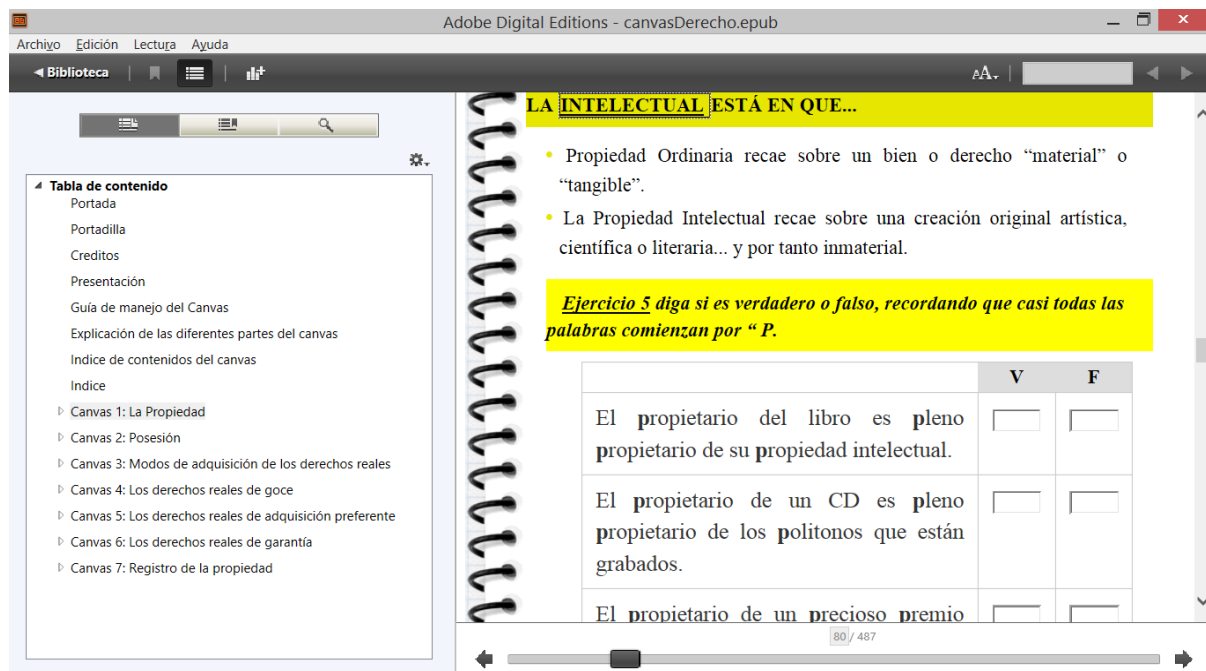


Figure 4: CANVAS self-evaluation example

The neuronal system provides considerable benefits of which we can mention the following:

- 1) Students **don't need to use other tools to prepare the subject.** (e.g. apart from the civil code, preparing the subject requires other special laws and documents, available at a click, so students **save time and money**). It is claimed that the currently available distance education platforms allow the update of the learning materials and resources included. Without detracting from this virtuality of the platforms, however, it is still true that, first, not all students relate to them (and mainly, with their forums), nor the extra explanations necessary for the understanding of this temporarily corseted subject, can be done in the forums; and second, that even in the paper version, the network of hyperlinks that the student can use inside and outside the CANVAS, as well as the self-assessment system by summary-phrases or brocades, is an added value of this new tool, as it provides a varied package of **all-in-one information**.
- 2) **Update of the subject.** Due to the scenario methodology and the technical tools, CANVAS allows professors keep the information updated.
- 3) **Individualized or personalized study.** The main benefit of CANVAS methodology is that it allows students to choose their own way of studying. Thanks to the neuronal system based on links and hyperlinks, students can browse the documents, jurisprudence etc.
- 4) **Personalized assessment**, in two senses: first, the self-evaluation designed based on the possibility of understanding the brocades, maxims or simple bold points offered by the teachers, is a new possibility of self-evaluation and may be an extra tool in the tutorials either when revising the subject well when the Tutor wants to propose an exercise in group discussion of the contents of the subject; and secondly, as CANVAS allows individualized learning, the assessment should be also individualized. It has been said that the student, according to his or her needs, time or interest, can reach knowledge and it must be greater or lesser rewarded.





Figure 5: Course presentation and guidelines

## 2. Scenario methodology

The neuronal CANVAS methodology is accompanied by scenario methodology. For two reasons: due to the difficulty of the subject ( in fact, statistics show that Civil Law III ( third year Civil Law) or Real Estate and Registry matters is more difficult than other civil law subjects like family law, contract law, succession law, etc,...This is mainly because it is squeezed into a semester although it is the most extensive and complex subject). I also have my experience in serious games (another way of learning and teaching. Many of you are already familiar with them as they were presented in a webinar). What I aimed to do was give students a comprehensive overview of the subject despite the short time I have to teach. The scenario I chose was the Solar System, as part of the Milky Way. The sun, that represents property (the main right in rem) around which three planets rotate (other derived rights in rem). They are illuminated by the strength of the moon, the satellite that represents the right of possession. Observing most of the elements in this scenario is the telescope or land register or property registration.

The connections or links proportioned by CANVAS thanks to this innovative book mean that this part of civil law is in the same harmony and balance as the universe.

Therefore, students can participate in their own way (according to their curiosity, time, etc..) in this Milky Way. They can interconnect with the sun and different planets with their stars, stardust, moon and telescope; seven parts or seven canvasses that form the EEB.

The combination of these two methodologies calls for a holistic approach.

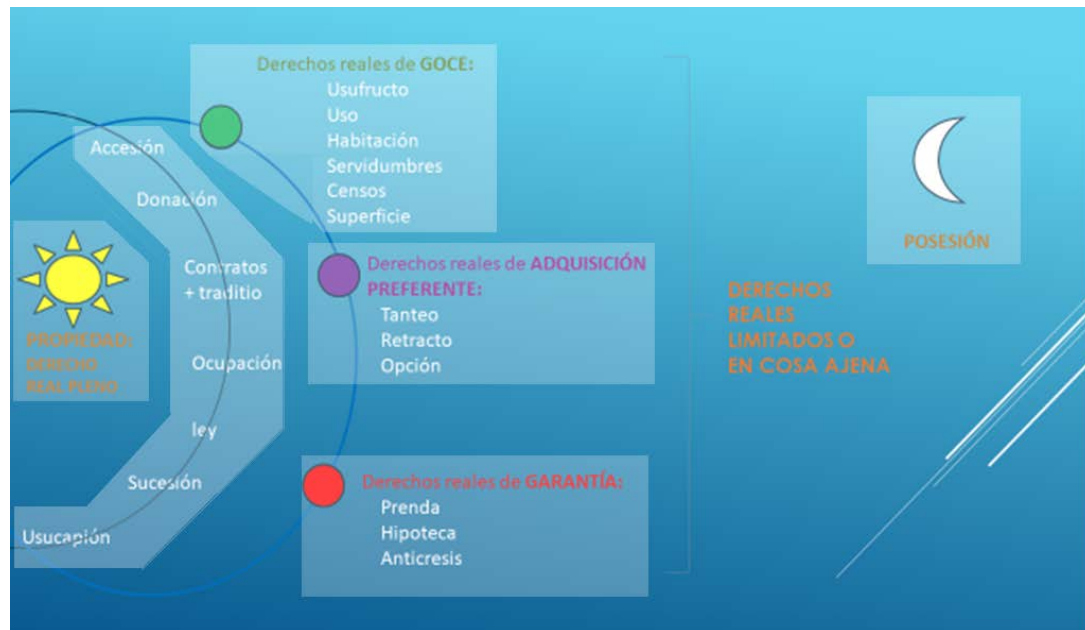


Figure 6: Holistic approach

### 3. Accesibility guidelines

The technical analysis of the accessibility requirements [Alonso et al, 2018] was based on e-pub accessibility requirements document prepared by UNIDIS<sup>8</sup>. The main points addressed and settled in the enriched e-pub result of CANVAS pilot project are:

1. Create a table of contents that allows students to navigate the document.
2. Ensure enough color contrast between text and background.
3. Include the metadata corresponding to the epub: title, author, etc.
4. Include alternative text in all graphic elements that require it.
5. Do not include content in images.
6. Structure the document correctly using existing standard tags.
7. The styles used must be uniform.
8. Ensure that the text remains legible when size is modified.
9. Ensure that the reading order is correct (scrolling is not permitted).
10. Ensure that it is converted correctly from text to voice.
11. If including videos, subtitles and a transcript of the content must be included.
12. If including audios, a transcript of the content must be included.
13. The audio and video player must be able to be used with a keyboard, in addition to being compatible with support products such as screen readers.
14. Other recommendations:
  - 1) Eliminate forced line breaks, as they may produce an incorrect display in certain readers and text size;

<sup>8</sup> \\nebulosa\recursos\DESARROLLO\GESTIÓN CONTENIDOS DIGITALES UNED\LIBRO DERECHO - DERECHOS REALES\version 3\201712\_Accesibilidad-epub.docx

- 2) Links can be used for cross-references or anchors, but links that jump to specific pages should be avoided the UNIDIS recommendation to indicate in the title property of the link or in the text of the link, which is a link, will apply external brackets so that the user knows that he has to change the window and go to the browser;
- 3) The notes must become final notes of the book or section. Note numbers must be converted to normal numbers, regardless of possible existing styles;
- 4) A file must be created for each section;
- 5) It should be considered that some readers do not support embedded fonts and that they will use the existing ones by default. Care must also be taken when using special characters;
- 6) It should review the styles in the tables. In addition, it should be considered that not all readers support formatted tables;
- 7) The forms must be correctly labeled, including the label, for, id, and other necessary labels. It must be ensured that they can be operated with a keyboard and that they are compatible with support products, such as screen readers;
- 8) Mathematical formulas: MathML should be used and avoid embedding mathematical formulas in images. In some cases, this format could give access problems since in some readers / browsers there is no total support;
- 9) Interactivity: If the document includes interactive elements, care must be taken that they are operable using a keyboard and compatible with the use of support product.

#### **4. Pilot development and technicalities**

UNED educational materials must comply with the regulations applicable in our University, mainly the Code of Conduct for teaching materials as well as with the protocols for evaluation of printed materials<sup>9</sup> of the Technical Unit of Teaching Materials ("Revisión de la Guía de Estudio de las asignaturas de Grado/Máster" approved by the UNED Governing Council in April, 2018, elaborated by "Unidad técnica de materiales didácticos" MADI). But to produce the CANVAS pilot project (the enriched e-pub) the participation of the UNED units for audiovisual production, legal assessment and accessibility requirements were required.

As the update of the software tool for digital content management was necessary for the development of the CANVAS pilot, it was decided by the vice-rector of methodology and innovation and the vice-rector of technology at the UNED in 2018, to offer the edition of the CANVAS to INTECCA one Associated Technological Center of the UNED. They collaborate with the UNED unit UNIDIS and the author to evaluate the accessibility requirements of the e-pub result of the pilot.

We faced two fundamental problems during the development and implementation of the electronic publication (ePub) of this project: 1. Replicate the Canvas Methodology of "scenario" and its connected content teaching method; and 2. Build a work flow, based on collaborative processes, characteristic of an innovation Project of this scope, in which a multitude of university bodies were involved (UNED) and carried out this innovative project.

They all came together with the sole objective of producing an electronic publication with "scenario" methodology, multimedia, accessibility and the added characteristic of being the principal study material of the basic bibliography of a core subject of a Law degree taught at UNED. This will make it possible to assess performance and results in regulated university teaching almost immediately.

---

<sup>9</sup> [http://www2.uned.es/iued/subsitio/MADI/Protocolo\\_IUED\\_Revision\\_Guias\\_CG\\_24042018.pdf](http://www2.uned.es/iued/subsitio/MADI/Protocolo_IUED_Revision_Guias_CG_24042018.pdf)

To deal with these technical issues we counted on the collaboration of experts in various sections of the organizations involved. They were all coordinated in a consistent work flow to achieve synergy and synchronize the tasks: CEMAV, CTU, EDITORIAL, INTECA and UNIDIS. Each one assumed the responsibility of reviewing the material according to their criteria and returning it to the main flow of the production chain, where others could then find it and carry out their function.

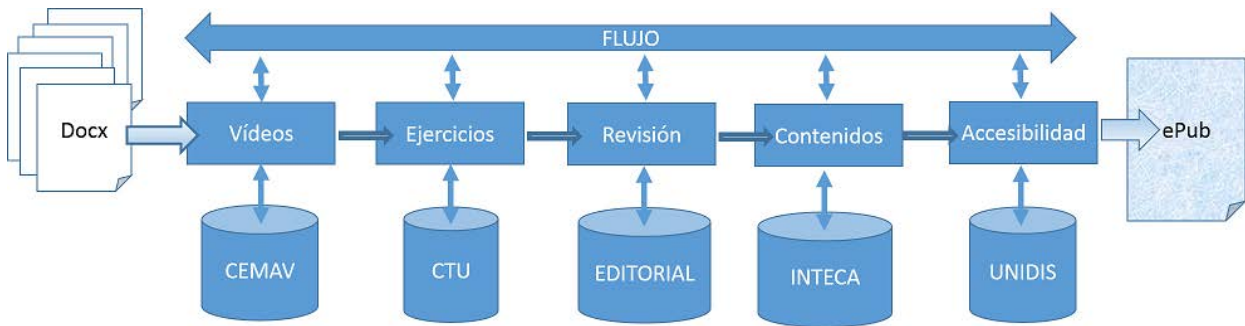


Figure 7: Production workflow

In summary, during the production of the enriched electronic book, the different UNED units that participated were: (1) MADi, technical unit of teaching materials at the IUED (Instituto Universitario de Educación a Distancia); (2) UNED Editorial; (3) INTECCA for the enriched e-pub edition; (4) UNIDIS (Centro de atención a universitarios con discapacidad), for the analysis and accessibility requirements; (5) CEMAV (Centro de medios audiovisuales), for audiovisual production and administrative management; (6) The legal advice unit for a report on the contract for the edition of materials in three formats (paper, e-pub, and enriched e-pub); (7) Vice-rectorate of methodology and innovation (2018) for the needed coordination of the previous isolated units.

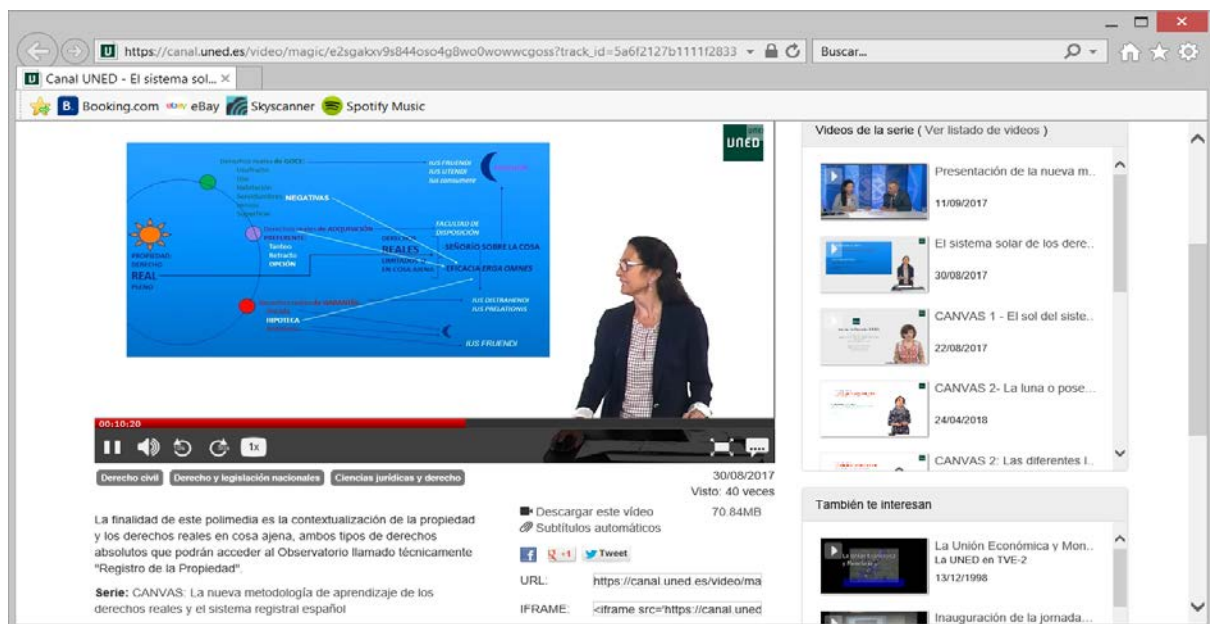


Figure 8: Audio-visual available at Canal UNED.

The workflow of the CANVAS pilot project followed the next steps:

1. MT Bendito, the author, has the book in Word version (September 2017) and prepares the report of the CANVAS pilot project and its annex to adapt to the official requirements of the UNED law degree (ID: 2501624) regarding descriptors, load (hours), evaluation etc.
2. The author presents the documentation, on behalf of the teaching team of the subject, to the Council of the Department of Civil Law of the UNED, who approves in April 2018.
3. IUED - MADI report received in July 2018.
4. Request for approval of the edition of the book to the Editorial of the UNED in October 2017, who approves in October 2018, in its paper, e-pub and enriched e-pub versions.
5. Update of the UNED Editorial contract, to incorporate in detail the edition of digital works (February 2018). Legal advice report and signing of the edition contract (November 2018).
6. Edition of the new unified study guide of the subject CIVIL LAW III: REAL RIGHTS AND MORTGAGE COD: 66023014, with references to the work and study methodology (June 2018).
7. Publication of the work (July 2019).

This year (2019) the students of the subject are going to benefit from the enriched e-pub during their studies and the project will continue with the evaluation of the success of the CANVAS methodology in the students learning.

## **5. Personal effort**

This CANVAS pilot project has been ended successfully with a huge amount of personal effort. Just as an example of the different aspects addressed by the author of the CANVAS enriched e-pub, we include in the following comments timed in different stages of the project.

- At the beginning of production, the contents were in Word. She delivers a very ambitious text because it has practically everything that a Word operating system allows you to do. The unit of INTECCA tells her that it is possible to do what she wants and with a timeline of three months. The idea was also to produce almost identical a paper version.
- Regarding the software used, the author could not imagine that (1) The Adobe Digital Edition (ADE) operating system, which is the only one authorized by the UNED for on the development of electronic works cannot perform certain actions that she imagined were easy computer; (2) the contents could not be reproduced as it was delivered in Word or in pdf, with tables of contents because INTECCA also had to type them at the risk of further transcription errors; (3) That her or INTECCA's mistakes could not be corrected in real time and that she had to describe where to correct them; (3) That any correction required to be bound by UNIDIS assessments, meant that INTECCA had to reproduce almost all the text correcting them even the hyperlinks; (4) That she had to do again the hyperlinks that characterized his work because she updated the different tables of contents and they were lost on that journey.
- Regarding accessibility, the author could not imagine that (1) The accessibility she wanted and she was told to enter would lead her to describe each image; (2) That IT solutions for accessibility would take a long time to use the ADE application; (3) The images she used to hyperlink them had to be done several times; (4) She had to modify the exercises for students with functional diversity or invent others; (5) The video classes were not subtitled when that the computer technicians requested it; (6) She has not achieved accessibility for the sensory disabled due to lack of UNED staff.
- POSITIVE FACTORS during the project are: (1) The dedication and special intervention of all UNED units involved (CEMAV-INTECCA, UNIDIS, IUED and CEMAV), even beyond their competence; (2) Work of the group with "incremental methodology", so that all the participants could be combined at the same

time without having to depend on phases in the intervention and modify the schedule when appropriate (via remote connection); (3) Choose the most operative and efficient accessibility formulas so that they are applied to the type of electronic book that is to be prepared; (4) Accessibility is possible with support from UNIDIS; (5) The pilot allowed the identification of new functionalities for the refinement and update of the available software.

## 6. Conclusions

Analysis of our experience in the production process leads us to the following conclusions, reflected in the final report on CANVAS, February 2019:

1. It is of utmost importance that the content be analysed by a multidisciplinary commission whose aim is to control the methodology of distance education.
2. The most accurate way for this team to work should be "integrated methodology"; so, computer developers, designers, accessibility advisors, publishers, should work together or when necessary during the production process.
3. In our case, it has been demonstrated that ADE is not suitable or convenient software for producing epubs<sup>3</sup>.
4. Therefore, the institutions should test or research new operative systems to produce this type of didactic materials better.
5. Perhaps we should reconsider other types of material for people with disabilities.
6. Despite our proposal for an incremental way of working guidelines or behaviour patterns or models to guide new production methods are required.
7. We need to know what the price of these EEBs will be for cost purposes.
8. The updating of the work in the future is still pending.

The summary of these conclusion would be: the outcome of the project shows that the CANVAS pilot project was a success. The time and effort that have been used have been very high.

The time and effort that have been used have been very high. However, despite the problems and issues we came up against in the creation of CANVAS, our units have been able to solve them. This shows that the EEB can be developed for other subjects in compliance with the regulations applicable here at UNED. The aim of this paper is to share with you, as Open Universities, the positive aspects of EEB learning experience in a core subject.

What remains is to tell you in the future, what impact EEBs and their methodologies have on student learning.

## References

Alonso, V.; Garcia, J.; Vega, J. (2018) Informe- 18.005 "Análisis Accesibilidad – Libro derecho".

Bendito, M.T. (2019) "Derechos reales e inmobiliario registral" Editorial UNED (enriched epub)<sup>10</sup>.

Navio, Julio; Garcia-Serrano, Ana; Bautista-Cerro, M. José (2018) "Piloting the production and distribution of digital contents in an open university", OOFHEC2018. <https://es.slideshare.net/EADTU/oofhec2018-julio-naviomarco-et-al-piloting-the-production-and-distribution-of-digital-contents-in-an-open-university>.

---

<sup>10</sup> [https://www.librosuned.com/busquedas/busquedas\\_NivelEstudios.aspx?asigs=01=66023014](https://www.librosuned.com/busquedas/busquedas_NivelEstudios.aspx?asigs=01=66023014)



## FRESH START

### Creating a sense of belonging for refugees through entrepreneurial learning and mentorship

**Patricia Huion**

UCLL, Belgium  
Patricia.huion@ucll.be

**Ahmet Sayer**

UCLL, Belgium  
Ahmet.sayer@ucll.be

#### **Abstract**

Creating a sense of belonging plays a crucial role in conquering obstacles in education according to the position paper 'Integrating migrants and refugees through education issued by the LLL platform (2016). To create this sense of belonging, the Horizon 2020 Fresh Start project invited refugees to become co-creators, trainers, European project writers and mentors in the course on entrepreneurship as integration path for refugees.

In this paper, we focus on the importance of business, wellbeing, and project writing mentorship in the context of design thinking starting from entrepreneurship as a wicked problem and organizing transformation conversations to foster co-creation.

The Fresh Start business mentorship empowers refugees to be more financial-sustainable, driven by their passions and career goals and ready to set up a new life in the host country. Fresh Start wellbeing mentors are aware of the participants' feelings such as missing, longing, guilt, shame, separation and loss, language degradation, value degradation, inferiority, non-identity, rootlessness, suspicion and prejudice, the experience of being a stranger or loneliness. The European project writing community of practice empowered refugees to create this sense of belonging through cultural and interactive integration. Both entrepreneurship course and mentorship resulted in turning the receiving country into a second home for refugees as what Moberg called active agents and creators of their future.

**Keywords:** Fresh start, entrepreneurship, integration, sense of belonging, mentorship, refugee entrepreneurs

#### **1. Introduction**

The Fresh Start programme started on 1st June 2017 and has successfully supported 120 migrant entrepreneurs across 3 EU states (UK, Belgium, Netherlands) over 2 years. It is an EU funded (DG GROW) partnership of 3 universities (UCLL Limburg, Zuyd university Maastricht) led by London South Bank University. The key UK partners were Citizens UK and NWES (small business training). The pedagogical approach combined active learning, connectivism, transformative pedagogy and network learning. Whereas the Dutch and British partners opted for a wide range of refugee and migrant participants, UCLL focused on recent, highly qualified refugees, 50% of which were residing less than a year in Flanders.

In this paper, we focus on this specific path developed by the University College of Limburg, more in particular on the importance of mentoring.

UCLL worked with highly qualified refugees starting from a majority with a bachelor degree, a minority with a master degree and a few participants with a Phd. Not only are there intercultural different translations of these levels, but also the Fresh Start participants have a great variety of fields of expertise. Some have a financial background, others are entrepreneurs in their country of origin while others are pediatricians, dentists, teachers, lawyers, gender experts, journalists, IT-specialists, architects, engineers.

How we created a sense of belonging throughout the full programme is introduced in the first chapter. The underlying concepts and the methodological approach can be found in the second chapter. The third chapter discusses mentoring in project writing, business coaching and well-being. In the conclusion, we define this sense of belonging as being part of a network of hosts welcoming new refugees.

## **2. UCLL FRESH START: steps towards belonging**

UCLL created a model of integration through international entrepreneurship as a network of hosts of expert-co-creator-entrepreneurs welcoming new refugees. UCLL, therefore connected to educational, entrepreneurship and integration intermediaries in the advisory board and the portal site, while starting up conversations with highly qualified refugees through WhatsApp, facebook, telephone and face-to-face conversations. Thirdly, UCLL sought feedback from the academic community through workshops and presentations within the Association of KULeuven, and conference papers: InHere2018, HEIRRI2018, Voices2018, ANGEL2019, SIETAR2019, OOFHEC2019, TEEM2019.

To empower refugees as expert-co-creator-entrepreneurs, UCLL developed a tailor-made 2D-game allowing refugees a) to find out more about the basics of entrepreneurship in Flanders and b) to find out whether entrepreneurship will be their path in the host country. UCLL has created a portal site linking initiatives from intermediaries- be it integration officers, entrepreneurship agencies, language course providers or volunteer organisations- as a point of entry for refugees. Thirdly, UCLL created a textbook on international entrepreneurship starting from the EntreComp Framework and the Guide book for Promoting and Supporting Migrant Entrepreneurship (EU,2016). As our target group has a very diverse background we also created an online rhizome course allowing the FRESH START participants to deepen their knowledge of topics of their choice. To attune our training, we organized meeting opportunities between the intermediaries of the receiving country and the newcomers: 2 advisory board meetings, 1 breakfast event, 3 design days for refugees, 2 networked training courses of 12 sessions, 2 demodays, 90 mentor sessions on well-being and on business plan, 1 day workshop on project management, 7 sessions on digital skills (coding), 8 sessions on writing European projects. On top of that we opened a WhatsApp group for all participants as a continuous help centre.

Thus, we reached more than 500 refugees. 102 applied for the FRESH START course on international entrepreneurship, 49 participants enrolled in the training courses. 40 participants asked for mentorship.

Our participants continued their journey either as an employee (6), an entrepreneur (9), a volunteer (3), and a student (3 finish master or PhD). As almost 50% of our participants were in Flanders for less than a year, these participants decided to upgrade their Dutch first and then pursue their goals (The Fresh Start course and mentoring were organized in English and Turkish).

The European Project writing group (5) has decided to continue as both our two projects 'EmergenCes' (KA2, linking skills of refugee teachers to the ones of teacher-refugees) and CommUnity (ISFP, using art communities to create a sense of belonging) got funded.

## **3. Methodological approach**

Fresh Start set out to create an integration path through entrepreneurship. To be able to do this, UCLL followed the benchmarking tool set out by the European commission in 'Evaluation and analysis of Good Practices in

Promoting and Supporting Migrant Entrepreneurship' (EC, 2016). The European commission situates this challenge with the Europe 2020 Strategy, more in particular in the Entrepreneurship 2020 Action Plan and its focus on facilitating entrepreneurship among migrants. The ten dimensions that have to be assessed are visibility, networking, legal and regulatory advice, individual business support, group business training, mentoring, access to finance, facilities provision, language and cultural sensitivity, impact.

This benchmarking tool was linked to social integration as structural, cultural, interactive and identificational integration (as developed by Bosswick & Heckmann and to the ten dimensions of integration by Ager & Strang, subdivided in markers and means (employment, housing, education, health), social connections (social bridges, social bonds, social links), facilitators (language and cultural knowledge, safety and stability), foundation (rights and citizenship).

Access to the core institutions such as the labor market, the housing system, education, the welfare state institutions, and full political citizenship are distinctive steps for structural integration. Cultural integration is defined both as acquisition of the core competencies within the receiving country and its culture, as well as the host country citizens finding ways to relate to newcomers and adapt to their needs. Cultural integration favours biculturalism and bilingualism rather than migrants having to give up their culture of origin. Interactive integration moves away from the ethnic community and builds links with the host community through social networks, friendships, partnerships, marriages, volunteer organisations. Finally, identificational integration is the result of newcomers' identification with the goals of the host society and their feeling of belonging to the receiving communities.

Crucial for this integration model is the inclusion of newcomers as actors in the action plans:

'Integration policies are often designed in a top-down manner, in which experts assume certain need in the immigrant population and accordingly apply certain measures. This approach will, however, fail if it does not take into account the migrants as actors, and their specific goals, needs, motivations, competencies or problems. 'Immigrants' here refers to both individuals and to immigrant organisations, which participate in the design and implementation of measures. (Bosswick & Heckmann 13)

That is why we approached the challenge of integration through entrepreneurship as a wicked problem, opted for design thinking, and organized transformational conversations to guarantee that we developed a tailor-made course addressing the real needs of newcomers while fostering understanding by all stakeholders.

Wicked problems are described by Rittel as 'a class of social system problems which are ill-formulated, where the information is confusing, where there are many clients and decision makers with conflicting values and where the ramifications in the whole system are thoroughly confusing' (Buchanan 15).

Design thinking starts with empathizing with the ones you design for. Empathy requires four basic attitudes: perspective taking or recognizing another perspective as the truth for the other, staying out of judgment, to see other's emotion and the ability to communicate this with others. It is feeling with according to Brené Brown.

The conversational intelligence matrix (Glaser,2014) offers a model to reflect upon the relationship you create through the conversational set-up. It differentiates between three levels: transactional, positional and transformational. At level 1, participants exchange information through the interaction of ask-tell. The participants answer/ask open questions to give/obtain information they need. On the next level, they explore each other's positions seeking a win-win solution. They engage in a power battle through advocate-inquiry dynamics aiming to persuade the other. When participants want to move to the transformational level, they need to acquire the ability to ask questions 'for which you have no answers'. The conversation is about sharing and discovering, finding connections between each other's perspectives, co-creating new approaches.

And the question we asked was how to create an integration course through entrepreneurship that fosters feelings of belonging?

#### **4. Case-studies mentoring**

We have already discussed the integration approaches in the training, that consists of textbook, face-to-face sessions (Huion et al, 2020) and 2Dgame, rhizome and adaptive learning environment (Subirat et al, 2019). In this paragraph, we focus on how we created this sense of belonging through project writing, business coaching and well-being coaching.

From the very beginning we defined entrepreneurship both in its narrow sense as in starting up a business as well as in its broad sense taking initiatives to create your own path in the welcoming society. Social entrepreneurship was also introduced and the lecturer of this chapter became the business coach: Annie Tanampai. She also participated in the community of practice for European project writers.

During the training sessions, participants were asked to develop a business idea bridging their own needs and the pains of the receiving country. From that exercise, some new ideas emerged and the desire to take action was channelled into a community of practice for project writers. Five newcomers and the Fresh Start Project manager sat together in a location offered by the new workplace of one of the newcomers: Hakan Aycicek. Not only did he participate in the community of practice for European project writers but he also offered the session on well-being in our training and became our well-being coach.

##### **4.1. Mentoring: Community of Practice for European project writers.**

Two projects were written and both got funded. Both adopted the methodology discussed above.

Emergences (Erasmus+, KA2 innovation) questions how refugee teachers together with teachers of refugees can increase the feelings of well-being in educational contexts for learners, teachers, governors and parents. The project sets up communities of practice for refugee teachers and teachers of refugees, collects good practices of collaboration, models this collaboration in a teacher training module and defines future roles for refugee teachers in education. Thus, it creates Visibility for teacher refugees, links them to the educational networks, informs them about the legal and regulatory requirements, gave them a group writing training and mentoring, provided financial independence as project writing is a means to gain an income, created a transformational space where teachers from a different background could discuss language and cultural sensitivities, and created job opportunities from volunteer to teacher-assistant, to teacher, to content developer and consultant (impact). The project focusses on employment and education, and stresses the importance of social connections. It is an example of cultural and interactive integration, and perhaps most importantly, it created a desire of belonging to this future society we, as project writers, created.

CommUnity (Horizon 2020, ISFP radicalization) questions how we can create a feeling of belonging through arts-based communities. In this project, the cultural, interactive and identificational integration are the main focus. Sense of belonging is positioned against the feeling of being disconnected resulting into radicalization of vulnerable young men. Social connections together with safety and stability are the main concerns here and refugees become cultural entrepreneurs creating transformational spaces where these vulnerable youngsters together with their parents and sisters become actors of their own future. Group mentoring, provision of facilities and respect for cultural sensitivities are the core themes for this project.

Most importantly our participants voiced a feeling of belonging, 'feeling at home', 'not being an alien anymore'. The uniform look of the proceedings 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.

##### **4.2. Business coaching by Annie Tanampai**

Typically, in our society, the entrepreneurial process often refers to steps and procedures that obtain and conduct entrepreneurial activities:

- Opportunity: being able to spot a market opportunity,
- Product and Concept: being able to create an innovative product that solves problems better than existing options, and can be manufactured at competitive prices,
- Mobilize and direct resources: being able to deliver a product to customers using a market entry strategy,
- Raise capital investment and building revenue and profitability stream,
- Sustain adds to the product and product growth retention: being able to inquire and retain the customers (Andrea Larson, 2012).

Nevertheless, if we study closely at what makes a person become an entrepreneur, such steps tell us little about why he/she considers to become an entrepreneur.

Entrepreneurship is not conditioned by birth, but it is a gradual process that is being produced through stages of experiencing and learning, and he/she is compelled to pursue a market opportunity. His or her engagement, commitment, motivation, and persistence through both favourable or dire situations, an ability to detect a market opportunity and create an innovative solution to a problem is the skill set that an individual learns during the entrepreneurial process.

An entrepreneurial individual must have the capacity to execute on a given business plan, a will to take risks while being able to assess them at the same time, an ability to go through failures without losing hope and faith in oneself and the nature of entrepreneurship and business. Having an interesting product idea, and a convincing business plan are all positively practical. Nonetheless, the ability of the entrepreneur such as being able to persist and execute dreams, and turn ideas into reality is another level of challenge.

Migrants and refugees are a group of people that have proved to the world that they have the ability to push through, persevere, persist, and are not given up to hardships easily. Most refugees and migrants obtain certain personality traits including risk taker, passion, perseverance, optimism, and creativity which are the crucial key to unlock the element that leads to entrepreneurship. Hardships and dire situations have somehow forced refugees and migrants to adapt in order to survive. At one point of their journeys, many of them, have been put in numerous challenging situations that teach them to take risks, make a crucial decision, to spot problems, and to learn to adapt to the new fast-paced environment. As a result, a migrant may have an advantage when it comes to practicing entrepreneurship in the host country according to Davidaviciene and Lolat.

The Fresh Start business coaching started with a visit of participants at their homes or a location they preferred, in an environment where they felt comfortable, safe, and at ease.

Such strategy proved to be effective because it

- helped me to gain more trust from the participants,
- helps participants to open up and share their personal thoughts and feelings,
- increases the accuracy of the information we get from participants (when they feel they are ready to open up to us),
- allows me to observe and understand better participants' circumstances, aspects, and ideas to start a new business or set career goals,
- increases engagement, involvement, and commitment from the participants,
- gives participants more opportunities to ask questions and to seek more specific help according to their needs,
- allows me to give more assistance to participants.

What was in it for participants?

- the sessions created a feeling of engagement and contentment,
- the sessions became not only a business mentorship, but helped them feel they were being heard and understood,
- the sessions helped them reduce stress and cope with anxiety,
- the business mentorship sessions gave them hope and inspirations,
- the sessions guided them in finding the next career path and future,
- the sessions helped them navigate to opportunities and resources that are available in the host country Belgium,

- most of the participants already knew what they wanted to do next. The business mentoring sessions helped them reassure they took the right decisions, gave them more confidence about themselves and their future in the new country,
- one of the participants recently got accepted at a University for her master's degree, a suggestion I gave to her as a step towards her dream career.

What did the UCLL Fresh Start team learn?

- Business mentorship sessions create tighter bonds between the participants and the Fresh Start programme,
- Listening to their life stories is important to understand their problems concerning their future career paths,
- The participants' stories reveal most of the participants have very impressive backgrounds of work experiences back in their home countries,
- Many participants have new ideas, but the majority wants to continue doing the job that they had,
- In the end, all participants have one thing in common, and that is to do something that helps society, be the change agent and help create solutions to the societal problems.

Going back to our initial frames of thought, we see that although employment was supposed to be the main focus, health as mental well-being emerged as an important collateral advantage. Business coaching appears to be commuting between structural and cultural integration with a humble tinge towards identificational integration when they want to be the change agents solving the pains of the welcoming society.

#### **4.3. Well-being mentoring by Hakan Aycicek**

In recent years, awareness has grown of the need to recognise the inner world of refugees and their children. After many years of clinical and supervisory work, Kristal-Andersson realized that there was an acute need for a treatment model that considers the specific psychology of these groups (1981). In her view, specialized process-related training in psychotherapy and its related fields, and in support work, is necessary to obtain psychological understanding of their difficulties, and to build up the knowledge, insight and confidence of professionals and others in working with them.

There has always been an acute need for understanding of and insight into the inner difficulties of refugees, immigrants and their children. These difficulties are caused, affected or complicated by fleeing from or leaving a native land, and the changes and conflicts experienced in living in and adapting to a new country.

Currently, it is of the utmost importance to achieve greater understanding of the outer (economic, cultural, environmental, and social) and inner (specific psychological) difficulties of refugees and immigrants. Broadly speaking, outer difficulties are regarded as being with matters such as adaptation to a new way of life, possibly even simply the climate, inner difficulties with psychic states of being, e.g. the experience of being a stranger or loneliness.

From reports in case-studies and in research that will be presented, it appears that the refugee and the immigrant – whether child, adolescent or adult – living in a new country, enters into a process of questioning prompted by the changes he/she is experiencing. Such questioning applies to both simple and complicated aspects of life and behaviour, from how to adapt to a different climate to understanding the inner workings of a new society and culture.

Regardless of homelands or the reasons why the individual migrated or sought refuge, the questioning seems to begin. It begins irrespective of sex or age, colour or ethnicity, or of landscape, environment, culture and religion of origin. Whatever the person's language or education, socioeconomic or political background or what he/she has endured, a process seems to begin of deeply and externally questioning new circumstances. This may be done consciously or unconsciously and may or may not find explicit expression. The refugee/immigrant seems to live between two worlds. He/she has changed countries and cultures. The language and customs are different. Values, religions and moral codes, even modes of thinking, may differ. He/she may have a different appearance than inhabitants of the new country.

Experiences in the new country – waiting for permission to stay; loss of society and political or religious place within it; lowered self-esteem; ambivalence to the new country; dream of returning to the homeland; refugee



turning immigrant when the situation changes in the homeland and he/she can return without risk; the choice of returning to the homeland. Any one factor may cause, influence or complicate symptoms and problems.

### **Methodology and Approach**

Fresh Start's life coaching (Well-Being) is based on the fundamental principle that there is critical requirement for being empathetic and awareness into the inner worries of refugees and immigrants. These worries are triggered and affected by fleeing from or leaving an inborn land, and the changes and struggles experienced in living in and familiarising to a new country.

Fresh Start's life coaching system aims at understanding of the outer (economic, cultural, environmental, and social) and inner (specific psychological) problems of refugees and immigrants such as adaptation to a new way of life, perhaps the climate, inner difficulties with particular psychic states of being, the experience of being a stranger or loneliness.

Mentors who are involved in Fresh Start project are aware of the participants' feelings such as missing, longing, guilty, shame, separation and loss, language degradation, value degradation, inferiority, non-identity, rootlessness, suspicion and prejudice.

Fresh Start implements support work and supervisions for the participants to aim at utilising their previous training and work experience, identifying common difficulties, dealing with specific refugee/immigrant problems, recognising and dealing with cultural barriers, gaining self-confidence and avoiding burnout.

### **Findings and Cases**

Fresh Start implemented one to one interviews for each participant and 'Beck Depression Test' questionnaire items were asked. As sessions notes are kept confidential, participants' overall feelings and sample cases that trigger them for those state of beings(feelings) mentioned in the report are without names and details. The common feelings that participants repeatedly expressed in the sessions are feelings of being a stranger, missing, separation and loss, inferiority and rootlessness.

**Feeling of estrangement:** When they arrived in Belgium as refugee, they and their children felt themselves as a 'stranger'. For them, everything is unknown and different. They must learn much of what was taken for granted in the homeland, from the simple to the complicated: basic tasks, habits, the language, the physical environment – the outer conditions of the new country. They said, it can be even more difficult to learn the inner characteristics of the new country, such as psychological and sociocultural attitudes, rights and wrongs, the way of life.

As a therapist, I challenged them with the following questions: Will you be an isolated person? – Will you, sooner or later, have contact with the inhabitants of the new country? – Won't you learn the language, customs and lifestyle of Belgium? I told them that if they spend years in the new country, and still have only stereotyped ideas about the majority population then this may lead them to remaining the stranger.

Case A: female participant, she describes herself as feeling like a stranger in society. She has had this feeling since she came in Belgium. She explained that it was rekindled by a form she received by mail which she could not understand. It was written in difficult, bureaucratic Dutch. Even though, she was at 2.4 level of Dutch, she has no idea what the mail was about. She could not find anyone to ask. It made her feel kind of depressed, she said.

**Feeling of loneliness:** They felt a sense of great loneliness during their stay in Belgium, they said. Those feelings gradually overwhelmed them and it became more serious as the months passed. Many of them have been forced to flee the homeland suddenly or under difficult circumstances. This feeling seems to be more severe especially for some of the participants who suffer combined experiences with a trauma.

Case A: male participant, he described the depression as a "feeling of loneliness that came over him". He felt he could not cope with life any longer. He did not want to go out of his house and felt indifferent to everything and everyone around him. His relatives from Germany visited him. It was soon after their departure that he became depressed, he explained. He had gone into a process of remembering, longing and feeling lonely. He remembered his parents and brothers, sisters and relatives, who remained in Turkey. He was unconsciously longing for his family and his country, and therefore feeling lonely.

**Feeling of missing:** Every participant throughout his/her stay in Belgium, miss – to different degrees – something, someone or someplace from the homeland. Feelings of missing are reported in my sessions and

this feeling is experienced to a lesser or greater extent during different periods of life in Belgium. They cannot go to Turkey and cannot choose to visit, or even return to their countries. I witnessed that some participants who are suffering traumas experience feeling of missing more than others because traumas force the minds to establish the environment in which the traumas took place. These feelings seem to become even more complicated when what is missing cannot be defined. The participants told that experiencing such feelings is painful, and appears to cause, influence or complicate their difficulties, and gradually lead up to their constant mood of missing.

Case A: female participant, life was without meaning for her, she felt indifferent about her study Dutch, her relatives and life in general. In the conversations, she could finally admit to herself how much she missed her homeland, her family, her friends and her language, which she could not return to. She had not, previously, allowed herself to have these feelings. P: "What good does it do to miss them. I can't go back...and I am not going to feel sorry for myself." She shared her inner suffering through long descriptions of the world and the people she had been forced to leave, but finally could express the missing in emotions and tears. In acknowledging, accepting and allowing herself to feel the inner pain of missing, she could reach a catharsis of feeling, without pitying herself. Feelings and tears do not bring back her homeland, her family, her world – but they released the psychological burden of the state of being missing.

**Feeling of separation and loss:** I noted that the participants have gone through many separations and losses because, especially during difficult times in their life, the sadness and internal worry of separation or loss of familiar people and environment are felt. I saw that many of them were not aware of s/he was in mourning. In the sessions, I encouraged them to elicit this feeling out since when such separations or losses are not realized or acknowledged, they may cause a constant pessimistic mood. I also expressed that not allowing themselves to grieve and not realising what they have been going through, they will experience melancholy, sadness and depression.

Case A: a male participant, he fled from his country because he had been a member of an opposition group against the ruling party of Turkey. He fled alone. His parents, brothers, sisters and other family members remained in the homeland. P: "My family is so happy I am here in safety. I could have died while I was passing Maritsa River, they keep telling me, when I call, and I want to come home." T: "You want to go home." P: "Yes, I have nothing here, no job, no language. My whole family is in the homeland." T: "You have freedom. You are getting a language education. Perhaps someday the situation will change in your country." P: "Yes, and then I could go back. But I am alone now." T: "I know, but you mentioned that you have many friends from Turkey in Belgium." P: "Yes. But they are not my family." T: "No, they are not." P: "I talk to my family often on the WhatsApp, but when I do, I miss them more. It is so hard hearing about their lives, and not being able to be a part of it." T: "Can you talk more about that?" P: "My mother complains about her health. My father is getting old. I would like to be there, so I could help them." T: "Your life would be at risk, if you return." P: "I know that, so I think about them all the time. I dream about them all the time." T: "What do you think about them?"

**Feelings of inferiority:** As far as the sessions I conducted for the participants are concerned, their feelings of inferiority often started to develop as they enter the Belgian society. I observed that these feelings can at first be based on the reality of the situation of being in a new country, may gradually become part of the individual, and influence his/her adaptation to the new country. They repeatedly told me that one's own language, way of living, work and play habits, are not valued nor useful. Important tasks, such as accessing health care, are difficult and complex. Simple tasks, such as buying food (halal or not), paying bills, and knowing how to dress appropriately, may become a problem. I saw that after a while each individual adapts to Belgium in his/her own unique way. However, I am sure that it will take months or years until he/she does not feel inferior, and such feelings may crop up even after a long period of residence in the country. Another observation is that these feelings may have a chain effect on other family members.

Case A: a female participant, she had a prestigious job in Turkey, a respected intellectual and socialist in her own country. She and her family were forced to flee from their country after the coup attempt in Turkey. Due to many different but mostly bureaucratic factors in the Belgium societal system she could not work in her own profession. She did not protest against this decision, because she was thankful to receive political asylum. VDAB, the unemployment agency, offered her some manual job offers, she said. She had always felt that manual labour is as important as intellectual work but had never done it before. She was in a deep state of inferiority.

**Feeling of rootlessness:** Throughout the sessions, the majority of the participants were complaining about their diffuse feeling of not belonging, of not feeling secure in the feeling that one exists and is needed, loved and wanted by people, by life itself. They identified this feeling with a metaphor: "An apartment with no ground or base". It appears to me that it is an unconscious, wordless feeling that seems to cause serious mental suffering. My psychotherapy experiences show me that rootlessness appears to be experienced especially during a depression or other crises. A person going through any kind of difficulty can usually find support in contact with family, friends and perhaps his/her childhood landscape or environment, i.e. his/her roots. Often, a person goes back to his/her "natural roots" when "feeling bad". This in itself can be healing or therapeutic and is often enough to overcome less serious emotional crises. However, what happens when the person does not have this important natural therapeutic support? A difficulty may then become harder to deal with and resolve as of the case for most of the participants. During their stay in Belgium, whenever they need the feeling of belonging and comfort that roots can give, since as a refugee they may not have them, and experience feelings of rootlessness. On arrival in the new country, they said, they feel that he/she is without roots and a secure base. Every participant suffered the feeling of rootlessness suddenly, or gradually, that lasts shorter or longer periods, I observed.

Case A: a female participant, she complained about a feeling of not belonging anywhere and thinking almost constantly about wanting to return. Her marriage is good. She likes her husband and is happy with her kids. She has Turkish friends in Belgium. The feeling of not belonging and not having anyone came over her suddenly when her diploma was not recognized and therefore not enough to get a job here. After getting this result, she began to think about returning, she explained. She questioned not only her existence and life itself but also her life in Belgium and the feeling that life could have been easier for her emotionally had she never moved here. Gradually, she realized everything she did have here. Only thing she needs is time, she said. She wants to finish her PhD degree here.

During the development of the UCLL FRESH Start approach there was discussion about the importance of sessions on well-being: should we not focus on entrepreneurship and the hard skills that are required to become an entrepreneur. However, we could not fail but notice, be it in the advisory board, during the breakfast event, the design days and the training sessions the participants' need to tell their life stories and their present emotional struggles. It is the reason why we felt we could not achieve integration in the domain of employment without addressing the health challenges posed by their emotional struggles. These well-being sessions confronted the UCLL FRESH START team with the emotional cost of solely focusing on entrepreneurship as integration path without establishing social bonds, clarifying cultural knowledge and creating bilingual communication. They showed us the pain of foregoing cultural and interactive integration. And they made us question the sense of belonging in identificational identification: sense of belonging in which country.

## 5. Conclusions and Recommendations

In approaching integration through entrepreneurship as a wicked problem, addressing it through design thinking and creating transformational conversations, the UCLL FRESH START team discovered a broader concept of integration. Becoming self-employed or finding a path of your own in the receiving country is not only about creating visibility of migrant entrepreneurs, introducing them into entrepreneurial networks, explaining legal and regulatory habits, connecting them to banks and crowdfunding organisations, providing them with project management skills and networks, increasing their digital literacy and creating a 24/7 WhatsApp helpline. Even when providing a group business training in a bicultural and bilingual context and individual business support, the well-being mentoring seems to be the gateway to being able to feel this sense of belonging and being able to move forward and start studying, become self-employed or get a paid job. This sense of belonging is closely related to the cultural and interactive integration, to understanding the mores of the receiving country and being able to create social bonds. That is why the community of practice of European project writers which consists out of FRESH START refugees and its Flemish project manager created projects connecting teachers of refugees and refugees in communities of practice or creating arts-based communities to offer a sense of belonging to vulnerable young refugees. Finally, all FRESH START participants favoured a sense of belonging to a future society in which they were accepted as co-creators.

In approaching integration through entrepreneurship as a wicked problem, addressing it through design thinking and creating transformational conversations, the UCLL FRESH START team discovered a broader concept of integration. Becoming self-employed or finding a path of your own in the receiving country is not only about creating visibility of migrant entrepreneurs, introducing them into entrepreneurial networks, explaining legal and regulatory habits, connecting them to banks and crowdfunding organisations, providing them with project management skills and networks, increasing their digital literacy and creating a 24/7 WhatsApp helpline. Even when providing a group business training in a bicultural and bilingual context and individual business support, the well-being mentoring seems to be the gateway to being able to feel this sense of belonging and being able to move forward and start studying, become self-employed or get a paid job. This sense of belonging is closely related to the cultural and interactive integration, to understanding the mores of the receiving country and being able to create social bonds. That is why the community of practice of European project writers which consists out of FRESH START refugees and its Flemish project manager created projects connecting teachers of refugees and refugees in communities of practice or creating arts-based communities to offer a sense of belonging to vulnerable young refugees. Finally, all FRESH START participants favoured a sense of belonging to a future society in which they were accepted as co-creators.

## 6. References

Ager, Alastair. & Strang, Alison. 'Understanding Integration: A Conceptual Framework.' *Journal of Refugee Studies*, 21(2), 2008, pp 166–191.

Bosswick, Wolfgang & Heckmann, Friedrich. "Integration of migrants: Contribution of local and regional authorities", European Foundation for the Improvement of Living and Working Conditions, 2006.

Bowlby, John. Attachment: attachment and loss. Vol. I. Basic Books, 1969.

Brown, Brene. (2012). *Daring Greatly. How the courage to be vulnerable transforms the way we live, love, parent, and lead.* Avery, 2012.

Buchanan, Richard. (1992). 'Wicked Problems in Design Thinking.' *Design Issues*, 8(2), 1992 pp.14-19.

Davidavičienė, Vida, and Ingrida Lolat. "Migrant Entrepreneurship in Europe: Challenges and Opportunities." 9th International Scientific Conference "Business and Management 2016," 2016.

European Union. Evaluation and analysis of good practices of promoting and supporting migrant entrepreneurship. Publications office of the European Union, 2016.

Feldstein, Stanley and Costello, Lawrence. (eds.). *The ordeal of assimilation.* Anchor books, 1974

Glaser, Judith E. *Conversational intelligence: how great leaders build trust and get extraordinary results.* Brookline, 2014.

Hjorth, Daniel. and Johannisson, Bengt. 'Learning as an Entrepreneurial Process.' *Revue de l'Entrepreneuriat*, vol. 8(2), 2009 pp. 57-78.

Huion, Patricia and Wade, Ross. How can migrant entrepreneurship education contribute to the achievement of the Sustainable Development Goals (SDGs)? The experience of the Fresh Start programme. To be published in 2020. 6p.

Kristal-Andersson, Binnie. 'Kan encounter-grupper lösa kulturella motsättningar? (Can encounter groups help to solve cultural conflicts?).' *PsykologTidningen*, 1, 1976, pp. 6-8.

- Kristal-Andersson, Binnie. 'Mot förståelsen av invandrarens och flyktingens inre värld (Towards understanding the inner world of the immigrant and refugee).' *Socialmedicinsk tidskrift*, 10, 1981, pp. 542-573.
- Krystal, Henry. *Integration and self-healing, affect, trauma and alexthymia*. Analytic Press, 1988.
- Larson, Andrea. *Sustainability, Innovation, and Entrepreneurship*. Flat World Knowledge, 2011.
- LifeLong Learning Platform, *Integrating refugees and migrants through education*. [http://lllplatform.eu/lll/wp-content/uploads/2016/09/lllplatform\\_integration-through-education\\_position-paper.pdf](http://lllplatform.eu/lll/wp-content/uploads/2016/09/lllplatform_integration-through-education_position-paper.pdf)
- Marlin, O. (1994). 'Special issues in the analytic treatment of immigrants and refugees.' *Issues in Psychoanalytic Psychology*, 16 (1),1994, pp. 7-16.
- McGoldrick, Monica. (ed.) *Ethnicity and family therapy*. Guilford Press, 1996.
- Miserez, Diana. (ed.) *Refugees: the trauma of exile*. Martinus Nijhoff, 1987.
- Moberg, Kare, Fosse Henrik B., Hoffman Anders, Junge Martin. *Impact of entrepreneurship education in Denmark*.Fonden for entreprenurskab, 2014.
- Moynihan, Daniel P. *Ethnicity theory and experience*. Harvard University Press, 1975.
- OECD. "Entrepreneurship and Migrants", Report by the OECD Working Party on SMEs and Entrepreneurship, OECD, 2010.
- Offer, D. 'Rebellion and antisocial behavior.' *American Journal of Psychoanalysis*, 31, 1971, pp. 13-19.
- Ram, Monder, et al. "Migrant Entrepreneurship: Reflections on Research and Practice." *International Small Business Journal*, vol. 35, no. 1, 2017, pp. 3–18., doi:10.1177/0266242616678051.
- Subirats Laia, Fort Santiago, Martín Álvaro, Huion Patricia, Peltonen Marika, Nousiainen Tuula, Miakush Iryna, Vesisenaho Mikko, G.M. Sacha. 2019. Adaptive techniques in e-Learning for transnational programs. In *Proceedings of Seventh International Conference on Technological Ecosystems for Enhancing Multiculturality(TEEM'19)*. León, Spain, 6pages.

## Decentralising online education using blockchain technology

### Alexander Mikroyannidis

Knowledge Media Institute, The Open University, UK  
alexander.mikroyannidis@open.ac.uk

### Allan Third

Knowledge Media Institute, The Open University, UK  
allan.third@open.ac.uk

### John Domingue

Knowledge Media Institute, The Open University, UK  
john.domingue@open.ac.uk

### Abstract

Blockchain technology provides a decentralised peer-to-peer infrastructure, supporting openness, transparency, accountability, identity management and trust. As such, the Blockchain has the potential to revolutionise online education in a number of ways. Blockchain technology offers opportunities to thoroughly rethink how we find educational content and training services online, how we register and pay for them, as well as how we get accredited for what we have learned and how this accreditation affects our career trajectory. This paper explores the different aspects of online education that are affected by this new paradigm. In particular, we investigate the different scenarios where the use of Blockchain technology can make online education more open and decentralised, while placing learners in control of their learning process and its associated data. Additionally, we discuss various approaches to the Semantic Blockchain and the applications of these approaches on online education.

**Keywords:** Blockchain, Decentralisation, Lifelong Learning, Accreditation, Semantic Blockchain.

### 1. Introduction

Education today is still controlled mostly by educational institutions, which offer quality, credibility, governance, and administrative functions. This model is not flexible enough and poses difficulties in recognising the achievements of a lifelong learner in informal and non-formal types of education. As a result, a lifelong learner's transition from formal to informal education and vice versa can be hindered, as the achievements acquired in one type of education are not easily transferable to another (Harris & Wihak, 2017; Lundvall & Rasmussen, 2016; Mayombe, 2017; Müller et al., 2015). Generally, lifelong learners have limited control and ownership over their learning process and the data associated with their learning. This indicates the need for a decentralised model across all types of education, offering learners with a framework for fully controlling how they are learning, how they acquire qualifications and how they share their qualifications and other learning data with third parties, such as educational institutions or employers.

The emergence of the Blockchain promises to disrupt online education by offering the technological means to decentralise it. Blockchain technology offers a decentralised peer-to-peer infrastructure where privacy, secure archiving, consensual ownership, transparency, accountability, identity management and trust are built in, both at the software and infrastructure levels. Although Blockchain technology introduces immutability and trust, we should also take advantage of the vast wealth of existing data and standards for decentralised data



publication and consumption on the Web. In particular, one of the core design principles of the Semantic Web is the assumption that data can be published anywhere online, and by anyone, and that it should be possible to query and integrate that data without aggregating it all into a central location. We argue here that a *Semantic Blockchain*, encouraging interoperability between Blockchain platforms and the Semantic Web, is essential to get the most out of both technologies. This is especially important in the education sphere, where learning experiences and accreditation can be acquired from diverse independent sources and according to different learning approaches, contexts and standards, but which still need to be drawn together to form a coherent and understandable picture of an individual's lifelong learning.

The remainder of this paper is organised as follows. First, we present a decentralised approach for online education based on the Blockchain, as well as a scenario showcasing the benefits of this approach for lifelong learners. We then discuss the different approaches to the Semantic Blockchain and their applications on online education. Finally, the paper is concluded and the next steps of this work are outlined.

## 2. A decentralised approach for online education

Within the decentralised model of educational transactions shown in Figure 1, learners create single authored or shared artefacts with their peers. At the same time, learners are enrolled on a number of courses and are making use of additional learning resources. Tutors and other teaching staff are providing informal and formal feedback as the learners complete summative and formative assessment. Central administration bodies are issuing formal certificates according to institutional processes.

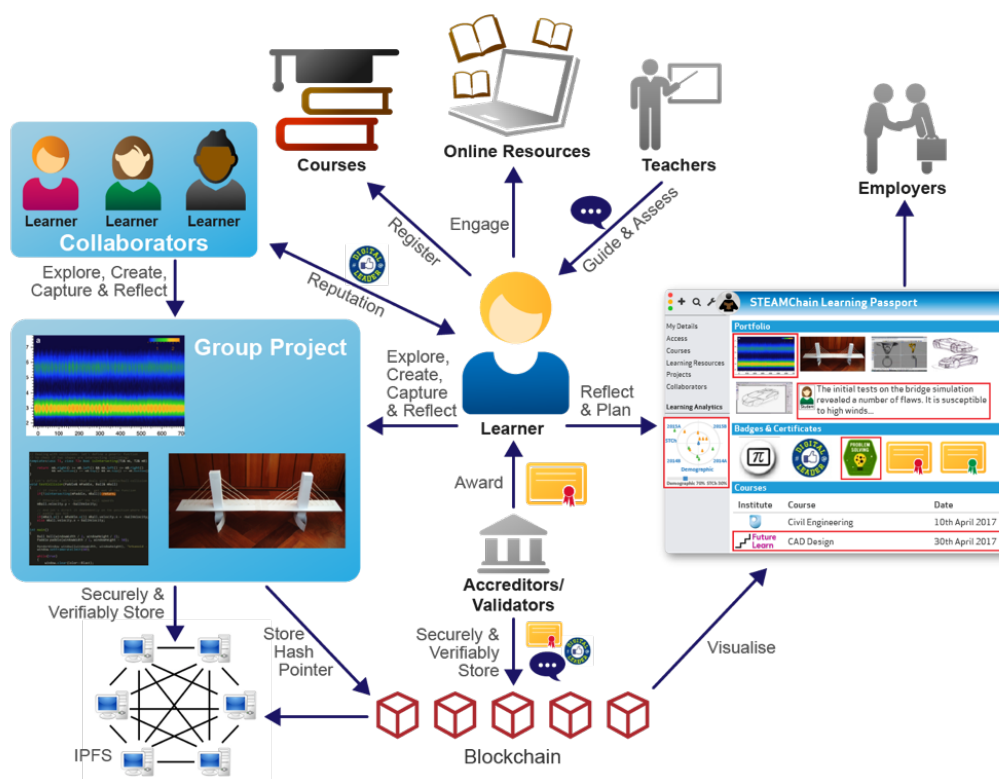


Figure 1: A decentralised model of educational transactions.

On top of these processes, we layer a reputational ecosystem, which allows learners to rate courses, online resources and teachers in terms of ease of understanding and attributes related to their specific learning goals. Learners can also rate each other on a range of qualities including, for example, organisational and communication skills. Our early work in applying this approach to academic reputation can be found at (Sharples & Domingue, 2016).

All data about learners' accreditation, work, ratings, formal and informal feedback are stored within a framework where everything is verifiable via the Blockchain. Because of the associated costs, large data files are usually not stored on the Blockchain. Typically, large files are stored elsewhere (off-chain) and referenced using a cryptographic hash. In the model depicted in Figure 1, we propose the use of IPFS for storing the learner's documents. This solution reduces storage costs and, at the same time, enables the validity of a document to be checked.

The following scenario demonstrates the potential impact of this decentralised approach on lifelong learning. Let us consider Jane, who works as a Junior Data Analyst in a London-based company. She is 30 years old and holds a B.Sc. in Computer Science. She is keen to advance her career in the field of Data Science; however, her demanding work schedule and daily commute do not allow her to return to full-time education for acquiring further qualifications. She is interested in informal and non-formal methods of learning, but she also seeks to acquire some type of accreditation for her learning.

Jane creates her personal Learning Passport, as shown in Figure 2. This is powered by Blockchain technologies and offers, among other things, a learning portfolio, as well as opportunities for social learning and peer mentoring. A core feature of Jane's Learning Passport is the provision of Smart Badges, which allow for detailed recording of accreditation in digital form from both formal and informal learning contexts with additional dynamic features. For example, apart from just recording a learning achievement, a Smart Badge can also offer job or course recommendations (Mikroyannidis, Domingue, Bachler, & Quick, 2018).

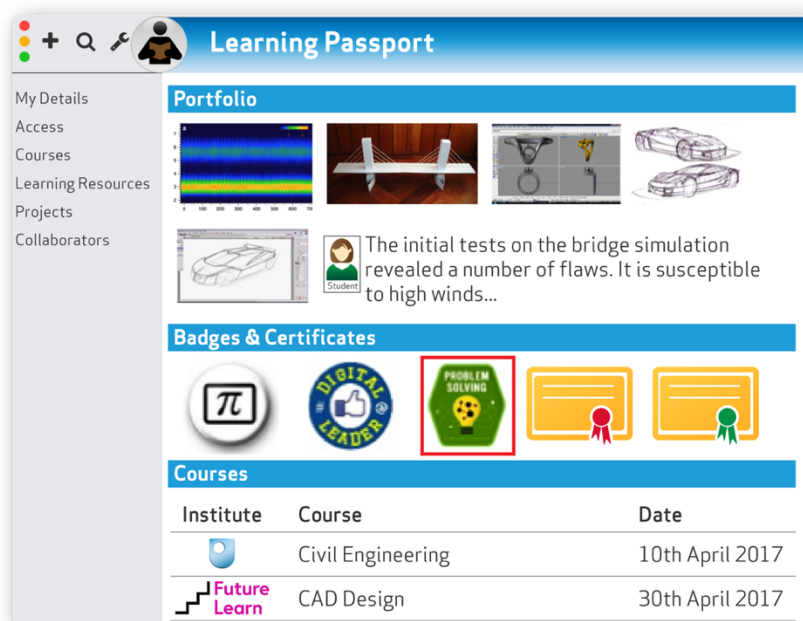


Figure 2: Example of a Learning Passport.

Jane enrolls to relevant open online courses offered by Higher Education Institutions (HEIs) in the UK and abroad, as well as relevant Massive Open Online Courses (MOOCs). Upon completion of these courses, she acquires certifications in the form of Smart Badges, which are added to her Learning Passport. Apart from just evidence of learning, the Smart Badges that Jane has earned can be used as dynamic accreditations in a number of ways, thus helping Jane in achieving the following goals:

- Finding new courses based on the gap between Jane's current skills and her desired jobs.
- Finding new job opportunities that match Jane's qualifications.
- Acquiring job promotions based on the new skills that Jane has mastered.
- Networking with other professionals and learners with similar backgrounds and learning goals as Jane.
- Identifying other learners that Jane can mentor and tutor in exchange for money or reputation points.

Jane is building her learning portfolio, which consists of the courses she has enrolled to, her assignments and the results of other exercises she has completed, such as quizzes, as well as the Smart Badges she has earned. All data in this portfolio is owned by Jane, who can also encrypt it or select subsets of it for release to others for a fixed duration. For example, Jane can release parts of her portfolio to potential employers two weeks before an interview. She may also offer access to HEIs, educators, trainers and other learners that follow a similar learning journey.

All transactions associated with Jane's Learning Passport are signed and time-stamped. The fact that the transactional record is visible to all and immutable resolves many of the problems associated with identity and fraud. As all data is permanently accessible, different consensual mechanisms can be put in place to link learner work to formal feedback and assessment. If desired, any principles underlying formal statements can be encoded in Smart Contracts, which allow the encoding of organisational rules, so as to be explicit for any interested party.

Jane finds micro-courses that have been produced by independent tutors and gains access to them via micro-payments, similar to purchasing an app on her smartphone. She studies these micro-courses and offers her feedback via ratings that count as reputation points for the authors of these learning materials. Other tutors can also reuse and repurpose these learning materials, upon agreement with the original authors. Jane decides to produce a free micro-course on the R programming language, based on what she has learned, in order to earn reputation points and enrich her portfolio.

Additionally, Jane has access to a network of learners that study together online and mentor each other. She chooses to mentor an early career data scientist in basic data analytics methodologies. She thus gains reputation points for acting as a mentor in this field. In return, she receives tutoring by an expert in Machine Learning and offers reputation points to her mentor. All these transactions are stored on the Blockchain, thus enabling easy transfer between units or organisations if needed and the automatic detection of any abuse of the system, for example pairs or small groups of employees favouring each other.

Jane is gradually building a strong portfolio in Data Science, with proof that she has gained advanced knowledge based on her earned badges, reputation points, as well as her learning activities and produced artefacts, all of which are recorded and stored in her Learning Passport. Even though she has not returned to formal education, she is now in a much better position to seek a promotion and advance her career.

### 3. The Semantic Blockchain

The Web is ubiquitous and provides one of the primary interfaces for humans to interact with digital data. By combining technologies especially from the Semantic Web with the Blockchain, the resulting *Semantic Blockchain* has the potential to promote highly interoperable trusted data, with significant applications to education.

The Semantic Web<sup>1</sup> is a collection of technologies and standards for the publication and consumption of machine-interpretable data at Web scale and according to the decentralised Web publication model. In particular, Linked Data, most commonly using the RDF data model<sup>2</sup>, is intended to serve as a standard for self-describing Web data, encapsulated by the Linked Data principles (quoted here from a W3C design note by the Web's creator, Sir Tim Berners-Lee<sup>3</sup>):

1. Use URIs as names for things.
2. Use HTTP URIs so that people can look up those names.
3. When someone looks up a URI, provide useful information, using the standards (RDF\*, SPARQL).
4. Include links to other URIs, so that they can discover more things.

By using shared *vocabularies* or *ontologies* -- Web documents which can establish shared URIs for common concepts and the semantic relationships between them -- Linked Data can be published in such a way that the *meaning* of data from independent sources can be interpreted by human or software consumers with little need for manual data alignment. Recent developments in the Semantic Web include the advent of decentralised "data pods" in software such as Solid<sup>4</sup>, from Sir Tim Berners-Lee, which aims to build a user-centred "human-friendly" Web by, in part, supporting individual hosting and control of one's own data. Complementary developments towards user-centredness in the Blockchain sphere include work on *self-sovereign identity* (Baars, 2016): technical solutions using Blockchains to manage digital identity in a way which gives users control over their online identity without needing to store personal information in a third-party facility.

The strength of the Semantic Web is in providing an easy framework for *combining* data from multiple sources. Applications of the Semantic Web in education include the Learning Object Metadata for annotation of digital educational material<sup>5</sup>, Open Badges<sup>6</sup> (from version 1.1 onwards, Open Badges are Linked Data), the ESCO ontology for annotation of skills, competencies and occupations<sup>7</sup> and Linked Data harvesting of employment opportunities<sup>8</sup>. Initiatives such as these enable new opportunities, particularly for lifelong learning. For example, an individual planning their future career moves could use Linked Data resources based on the skill requirements of job postings and their existing set of qualifications to identify, automatically, learning

---

<sup>1</sup> <https://www.w3.org/standards/semanticweb/data>

<sup>2</sup> <https://www.w3.org/standards/techs/rdf>

<sup>3</sup> <https://www.w3.org/DesignIssues/LinkedData.html>

<sup>4</sup> <https://solid.mit.edu>

<sup>5</sup> <https://ieeexplore.ieee.org/document/1032843>

<sup>6</sup> <https://openbadges.org>

<sup>7</sup> <https://ec.europa.eu/esco/resources/data/static/model/html/model.xhtml>

<sup>8</sup> <http://edsa-project.eu>

materials and opportunities which would be relevant to add to their learning portfolio in order to reach a desired goal. However, the issue of *trust* becomes relevant when data is being drawn from multiple independent sources, particularly when it is valuable. Because of the consequences of one's educational record on career, lifestyle and travel opportunities, there is a strong potential motivation for fraud, for example. How are we to know whether a particular source of data is trustworthy with regard to its contents and history?

We can distinguish different kinds of trust. Let us start with the example of an educational qualification. In order to be able to accept a presented qualification as accurate, it is important to know where it came from - which institution, for example, for which learning opportunity; to whom it applies - the learner identity; and that the qualification presented is the same qualification that was originally issued. In brief, we need to have trust in *provenance*, trust in *identity*, and trust in *integrity*.

Provenance in educational data covers a number of factors. These include: the history of a piece of education-related material or of certification - when was it created, what was the learning context, what or who endorses it, and so on; the identity of learners and of issuing bodies - is the person presenting, or claiming to be the subject of, some educational data the same as the person it is actually about or from; and integrity - after publication, has the data been altered in anyway? For example, has a qualification been altered to show that it was of a higher level than it actually is?

These trust concerns apply generically outside the education sector as well and require a generic solution. The idea of the Semantic Blockchain is to add a trust layer to the Semantic Web in general, motivated initially by our work and applications in the realm of education.

There are a number of different ways in which Blockchain technology can be used to verify the integrity of data. The core idea remains the same: by publishing data on a Blockchain, a transaction is recorded on the distributed ledger. The transaction record will show the data along with a timestamp showing when it was published. By the nature of the Blockchain, this record is immutable, and anyone with access to the chain can verify that the transaction, its timestamp, and its data contents, have not been altered since that time. Anyone carrying out such a check can be assured that data integrity has been maintained: if the data being presented for verification has been tampered with, it will be possible to detect this and to prove that tampering took place. (Third & Domingue, 2017) present a survey of different specific approaches to making data distributed and trusted, varied along several dimensions, from the degree of data replication, to the levels of integrity guarantee provided, to the cost. The simplest model - in which all data is stored on-chain - has a number of disadvantages. One of these is expense - adding data to a public Blockchain costs money - but even without a cost factor, this poses data protection issues. Educational data contains at least some personal data, and it contravenes good data protection practice and law to store such data in a public space, particularly one which does not allow it to be edited/corrected or deleted. As a result, it is preferable to methods which keep actual data elsewhere, and store only verification data on-chain: something such as a cryptographic hash, which takes up little space and which can only be calculated from the actual data it represents, and which cannot be used to recreate that data. Distributed storage networks such as the Interplanetary File System (IPFS) are a practical match for Blockchains, being based on similar hashing mechanisms.

To build a Semantic Blockchain, then, we can integrate personal semantic data pods in Solid, using the IPFS network for larger storage, and with both components connected to a Blockchain infrastructure to provide integrity guarantees. *Provenance* is given by immutable timestamped records (as Linked Data) stored alongside the data and which can be cryptographically proven to be associated with that data. *Identity* (including data access control) is provided by self-sovereign identity systems, and *integrity* is provided by the Blockchain itself.

Collectively, these support *trust* in the data. By using Linked Data throughout, we ensure the maximum potential for learners and educators to connect their data with that from other sources, and so to get the maximum use from their own data; by particularly using Solid data pods, we ensure that data remains under user control. Figure 3 shows the main components of the Semantic Blockchain approach we are pioneering in ongoing work, known as *LinkChains*.

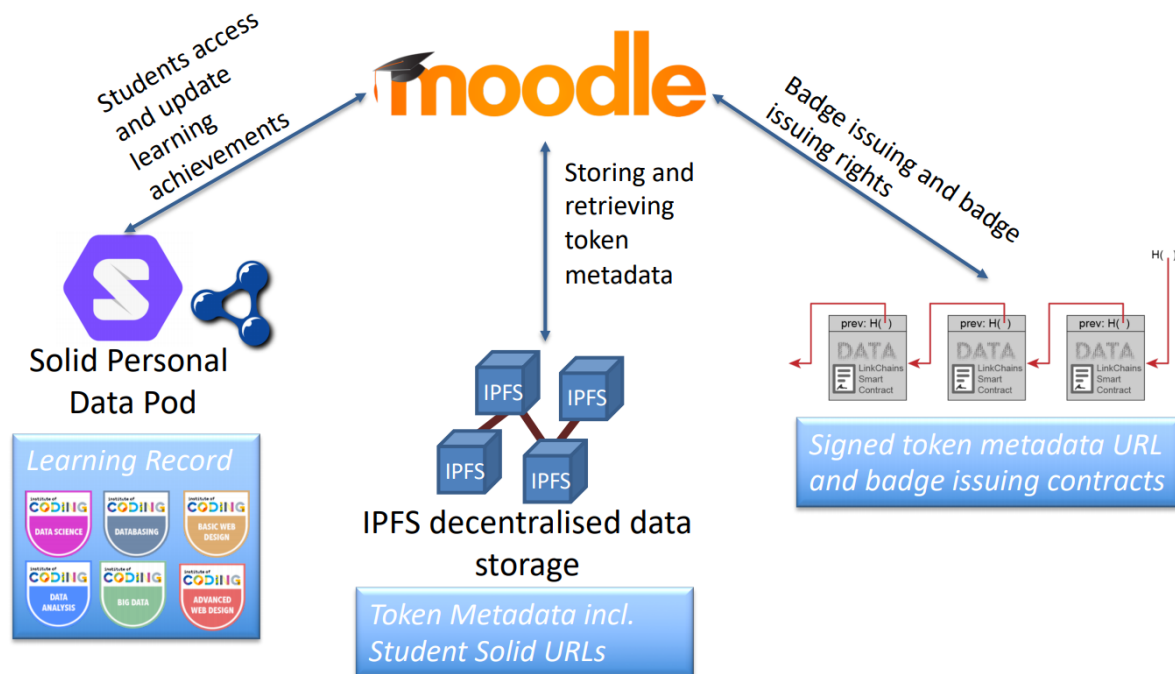


Figure 3: A Learning Management System (Moodle) communicating with the three main components of a Semantic Blockchain.

The focus on personal interoperable trusted data opens up new possibilities for pedagogical technology and approaches. One of the most exciting is the potential for *lifelong learning analytics*. Instead of learning activity data being collected, and analysed, solely within a specific institution, leading to data silos relating to the same learner being spread across multiple institutions across a lifetime of learning, by storing this data with the user and trustable under user control, it becomes possible to perform learning analytics over time and in diverse educational contexts. Tools can be developed to support learners in understanding their own learning approaches from their own data, as well as supporting wider learning analytics carried out across populations, with user consent. The use of Semantic Blockchains makes this possible; without the security and trust, and the common data models enabled by Linked Data, it would be considerably more difficult to carry this out.

#### 4. Conclusions

This paper has presented the different applications and impact of Blockchain technology on online education and lifelong learning. We have presented a decentralised approach that enables learners to plan their learning journey more efficiently based on their desired career trajectory and offers them full control and ownership over their learning artefacts and processes. We have also discussed various approaches to the Semantic Blockchain and their applications on online education. The Semantic Blockchain offers a solution for bringing together all acquired learning experiences and accreditation, in order to form a coherent picture of an individual's lifelong learning. Impact on lifelong learning is significant, as learning experiences and



accreditation can be acquired from diverse independent sources and according to different learning approaches, contexts and standards.

We are currently preparing the next steps of this work, which will be conducted in the context of the QualiChain<sup>9</sup> research and innovation project. QualiChain brings together a consortium of government agencies, universities and private companies across Europe, to investigate the technical, political, socioeconomic, legal and cultural impact of blockchain-based decentralised solutions on education. The project is targeting four key areas for exploring the impact of decentralised solutions on education: (i) lifelong learning; (ii) smart curriculum design; (iii) staffing the public sector; (iv) providing HR consultancy and competency management services. Within these key areas, we will be applying the decentralised approaches presented in this paper, in order to develop, pilot and evaluate decentralised solutions for storing, sharing and verifying education and employment qualifications.

## 5. Acknowledgement

This work has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 822404 (QualiChain).

## 6. References

- Baars, D. (2016). *Towards self-sovereign identity using blockchain technology*. University of Twente.
- Harris, J., & Wihak, C. (2017). To what extent do discipline, knowledge domain and curriculum affect the feasibility of the Recognition of Prior Learning (RPL) in higher education? *International Journal of Lifelong Education*, 1-17.
- Lundvall, B.-Å., & Rasmussen, P. (2016). Challenges for adult skill formation in the globalising learning economy—a European perspective. *International Journal of Lifelong Education*, 35(4), 448-464.
- Mayombe, C. (2017). An assessment of non-formal education and training centres' linkages with role-players for adult employment in South Africa. *International Journal of Lifelong Education*, 36(3), 339-358.
- Mikroyannidis, A., Domingue, J., Bachler, M., & Quick, K. (2018). *Smart Blockchain Badges for Data Science Education*. Paper presented at the IEEE Frontiers in Education Conference (FIE), San Jose, California, USA.
- Müller, R., Remdisch, S., Köhler, K., Marr, L., Repo, S., & Yndigegn, C. (2015). Easing access for lifelong learners: a comparison of European models for university lifelong learning. *International Journal of Lifelong Education*, 34(5), 530-550.
- Sharples, M., & Domingue, J. (2016). *The blockchain and kudos: A distributed system for educational record, reputation and reward*. Paper presented at the 11th European Conference on Technology Enhanced Learning (EC-TEL), Lyon, France.
- Third, A., & Domingue, J. (2017). *LinkChains: Exploring the space of decentralised trustworthy Linked Data*. Paper presented at the Decentralising the Semantic Web, Vienna, Austria.

---

<sup>9</sup> <https://qualichain-project.eu/>

## Effective learning from captioned video lecture in a foreign language: literature review

**Maria Pannatier**

Geneva University, Switzerland  
[Maria.Pannatier@etu.unige.ch](mailto:Maria.Pannatier@etu.unige.ch)

**Mireille Betrancourt**

Geneva University, Switzerland  
[mireille.betrancourt@unige.ch](mailto:mireille.betrancourt@unige.ch)

### Abstract

In a multilingual landscape of European education, a video lecture delivered in a foreign language (FL) poses certain challenges for students. One of the instructional supports to aid students' comprehension is to provide the commentary of the video in the written mode. However, an important question is whether the commentary should be delivered in the language of the video (captions) or the language of the learners (subtitles). To answer this question a literature review was conducted, which resulted in defining three sets of studies which explain the beneficial or detrimental effects of captions/subtitles for learning outcomes: 1) learning a FL; 2) learning academic content in a native language; 3) learning academic content in a FL. The effects of captioned video on learners' performance in learning a FL in most cases proved to be positive except for low proficiency learners. However, the results of studies in other subject areas provide evidence that captions can also hamper learning because they cause a split attention effect that increases the extraneous cognitive load required to process the instruction. Besides, little is known about the effect of subtitles for content learning. Finally, the effect of captions may depend on the subject area, learners' language proficiency and expert knowledge, learning strategy (if they are used or trained to use captions), captions positioning on the screen, visual-textual content complexity, the "subtitles effect". The proposed literature review will outline the controversial research results and discuss the suggestions for further research in the context of autonomous online learning.

**Keywords:** video lecture, online learning, video-based learning, captions, subtitles, content learning in a foreign language, instructional aide, learning from captioned video

### 1. Introduction

Growing European cooperation in higher education, educational mobility programmes, joint-curricular nets, and MOOCs stimulate the growth of multilingual learning environments in higher distance education (Henderikx & Jansen, 2018). Having become a popular medium among students, video has interesting affordances for learning thanks to a variety of functions (e.g. showing authentic situations, demonstrating procedures, providing a narrative for understanding complex phenomena) (Derry, Sherin, & Sherin, 2014). At the same time, video lecture poses many challenges for certain students especially when it is delivered in a foreign language (FL). They have to cope not only with difficulties in listening comprehension<sup>1</sup> of an academic video that they typically encounter which are associated with the audio channel (e.g., unfamiliar vocabulary, speech rates, prosody, and syntactic structures), but also need to process, understand, and respond to the content presented in the accompanying visual channel. Besides, they need to be actively engaged with video and develop new knowledge.

---

<sup>1</sup> Listening comprehension is here defined following Rubin (1995) as "an active process in which listeners select and interpret information which comes from auditory and visual cues in order to define what is going on and what the speakers are trying to express" (Gruba, 1997, p. 7).

One of the instructional supports to aid students' comprehension is to provide the commentary of the video in the written mode. However, an important question is whether the commentary should be delivered in the language of the video (captions) or in the language of the learners (subtitles)<sup>2</sup>. One more important question is that though the effect of captioned viewing in some cases proved to provide benefits for comprehension among various groups of students with disabilities, and those learning a FL, the question of when and how to use the captions to their advantage remains unsolved.

Therefore, this paper is aimed at better defining the effects of the instructional aid provided by closed captions and subtitles necessary for individual comprehension of a video lecture in comparison to a native comprehension within multimedia learning theory (Mayer, 2009, 2014) and from the point of view of various research domains: 1) learning a FL; 2) learning academic content in a native language; 3) learning academic content in a FL. A second practical objective of this literature review is to contribute to discover the unsolved issues with the captioned video lecture learning and provide series of suggestions for further research and practice.

In this respect, the first area of interest is the adult self-learning where independent learning from video lecture has reached the top popularity (Ritzhaupt, Pastore, & Davis, 2015) still though with the sparse literature on the effectiveness of online educational videos (Guo, Kim, & Rubin, 2014; Lin, 2011; Shoufan, 2018). The second area of interest is multimedia learning from captioned videos with inconsistent results found in the literature (Mayer, 2009; Ritzhaupt et al., 2015; Shepherd, Simonian, & Trussler, 2017; Tisdell & Loch, 2017; van der Zee, Admiraal, Paas, Saab, & Giesbers, 2017; Vanderplank, 2016). And finally, the learning strategies watching captioned video, especially when the students use the captions not for a FL learning but for learning in a FL, need to be researched further. As students made little use of interactivity (Bétrancourt & Benetos, 2018, p. 8), it is important to investigate online processes in order to identify how the strategies relate to learners' individual characteristics (e.g. FL proficiency) and how they interact with design issues (e.g. captions and subtitles) and scaffold students' learning strategy.

## **2. Multimedia learning with captioned video**

### **2.1 Video lecture in online learning**

Extensive video viewing has become the most popular teaching method with a video lecture (instructionally designed or recorded as a part of an online/blended course for independent processing) being a part of formal and informal educational contexts (e.g. university courses, MOOCs, YouTube, iTunes U, BBC iPlayer).

The literature provides some evidence for the effectiveness of online educational videos in students' learning: on the engagement with online video lectures (Guo et al., 2014; Monje, 2016), on fostering learning autonomy (Hafner & Miller, 2011), on video feedback (Hung, 2016), on video comprehension strategies (Lin, 2011). General features of educational videos such as production style and video length were investigated to some extent. However, the actual cognitive features of educational videos available on the Internet have remained almost untreated. In spite of video popularity, most of the recent research results suggest that further research is required to identify and specify additional cognitive features in educational videos towards a deeper understanding of the video cognitive value (Shoufan, 2018). Besides, exactly how different video lecture types impact student performance has seldom been studied (Chen & Wu, 2015).

Whereas computer animation mostly represents conceptual models of dynamic phenomena (Bétrancourt, 2018), video is mostly used to convey procedural content, and particularly sensorimotor

---

<sup>2</sup> This paper uses the term "captions" for the textual screen representations of a soundtrack in the same language as the audio, i.e. bimodal subtitles, and the term "subtitles" is referred to the same representations but in the native language of the viewers that accompany the second language soundtrack of the video material, called sometimes "reversed subtitles" in the literature or "translations" in YouTube videos.

procedures, i.e. conceptual and procedural explanations. Thus, further research should pay much attention to what is to be learned from the video and how the very nature of video supports the learning processes and outcomes (Bétrancourt & Benetos, 2018, p. 6). Therefore, video lecture is considered here as a kind of videotext broadly defined as a multimodal text consisting of contiguous, dynamic, and interwoven sounds (verbal, musical and/or background) and visual images (still, moving, text and/or graphic) which can be presented using a range of media (Cross, 2011), basically a type of multimedia material combining image, sound, and text (Lin, 2011).

Instructional videos aiming at changing knowledge of individuals can achieve various learning goals, e.g. the categories of learning: doing, saying, engaging and seeing (Schwartz & Hartman, 2007). Besides, the revised Bloom's taxonomy offers the scale of learning outcomes that helps to specify the type of video and thus, precise the research results. (Krathwohl, 2002).

## 2.2 Video captions or captioned videos

With video technologies advancement captions have become an inherent part of video viewing. Thanks to this technological add-on designed initially for the benefit of deaf and hard-of-hearing people, FL learners with normal hearing and non-native speakers watching TV and online videos for various purposes use them as an aid to better understand the provided video content (Vanderplank, 2016).

Over the years, several different terms have been used to describe these same-language subtitles. The standard term in North America is "closed captions" (often seen as CC on media such as YouTube), since they do not appear in vision but can be revealed through the closed caption decoder built into the television set. In translation circles, they are described as "intralingual subtitles" in contrast to "interlingual subtitles." In the UK and some other countries, they were known as Teletext subtitles, as they were broadcast through the Teletext information system. In non-English-speaking countries, they tend to be called the equivalent of "subtitles for the deaf and hard-of-hearing" (e.g., in France, "sous-titres pour les sourds et malentendants") (Vanderplank, 2016).

The recent research on subtitles often used the terms "captions" and "subtitles" as synonyms differentiating between subtitles in someone's native language, called L1, versus subtitles in one's second language, or L2 (e.g. van der Zee et al., 2017) or bimodal subtitles (subtitles in the same language as the audio) (e.g. Shepherd, 2017).

In this paper, following FL learning tradition (Winke, Gass, & Sydorenko, 2013) the term "captions" will be used for the textual screen representations of a soundtrack in the same language as the audio, i.e. bimodal subtitles, and the term "subtitles" will be referred to the same representations but in the native language of the viewers that accompany the second language soundtrack of the video material, called sometimes "reversed subtitles" in the literature or "translations" in YouTube videos. The reduced form of captions known as "keyword" captions, is not taken into consideration.<sup>3</sup>

## 3. The effects of captions in multimedia learning research

### 3.1 Learning a foreign language with captioned video

The use of captions has become a common and effective technique and one of the "success factors" in FL learning. There have been approximately 130 studies on captioned viewing and FL learning since the R. Vanderplank's state-of-the-art review in 2010, most of it replicating what we already know but in different contexts (Vanderplank, 2010, 2016). Previous research using films in laboratory settings has found the captions result in better content and vocabulary comprehension for non-native speakers (Mayer, Lee, & Peebles, 2014). Captions provide a simple means of controlling the verbal element of audiovisual material

---

<sup>3</sup> Research on keyword captioning has produced studies with mixed results. The motive usually given for using keywords in captions rather than verbatim or near-verbatim captions is to lower the (cognitive) load on learners, especially lower-level learners and those with slower reading speeds, without reducing greatly the comprehension of what is being viewed (Vanderplank, 2016. P.106).

without substantial teacher preparation and also provide crucial support for learners in informal and independent settings (Vanderplank, 2016, p. 19). A meta-analysis of 18 studies showed positive effects of captions for language learning (van der Zee et al., 2017).

In his latest book, Vanderplank (2016) continues reviewing some key areas into captions and language learning and highlights the insights that have been gained from this work. In their seminal work, Price and Dow (1983) found that all those who saw the captioned film benefited significantly from captioning even with only one viewing, regardless of educational level or language background. Investigating the students' attitude, Vanderplank (1988) showed that European exchange students found captions beneficial and not distracting to their language development in watching various TV programs in a FL, as well as increasing motivation and reducing anxiety. Further on, these ideas were developed and supported by Perez (2013), who is much cited in the recent works in this field (e.g. van der Zee et al., 2017; Tabbers, 2018; Suarez and Gesa, 2019).

Vanderplank (1988) had a paradoxical finding for that time since it might have been expected that if watching television programmes without captions already took all their concentration and effort, then adding another channel would overload their processing capacity. By the end of the term-long study, students reported that they could use the captions so flexibly and manage such larger chunks of text and sound that they had spare processing capacity, which could be used for maximizing the potential usefulness of the language in the programme, in both speech and text. In his second study, he found out that captions enabled the students to attend to, and follow, what was being said with note-taking or pre- or after-viewing exercises, i.e., develop their listening comprehension skills. His third study proved that captioned viewing was more useful for learning than entertainment purposes (Vanderplank, 2016, p. 66). Other studies have found similar positive effects of captions on learning from videos. There appears to be a consensus that they are beneficial for learning a FL.

On the contrary, there exist inconsistent research findings in the literature concerning the effects of subtitles (captions in the mother tongue) in FL learning. Firstly, the more familiar the students were with watching programmes with subtitles in their mother tongue, as in the case of a Danish subject, the more rapidly they adapted to English captions and developed strategies for using them to best effect (positive results). Secondly, in the studies with mixed results, the findings varied according to question type, level, background knowledge, film clip and treatment condition (Vanderplank, 2016). Thirdly, Mitterer and McQueen's study (2009) challenged the previous research results with their detrimental and even harmful effect of subtitles for the low proficiency Dutch language learners of English. So, the discussion on captions or subtitles is still open in FL learning domain though Vanderplank continues to argue that "...rather than treating L1 subtitles as "harmful," it would be better to characterise them as second best compared to L2 captions, as potentially useful where L2 captions are not available (as is the case throughout much of the world) and where learners are below the threshold of reading speed and knowledge" (Vanderplank, 2016, p. 101).

However, these are all studies that focus on learning a language and not on learning about a non-linguistic topic in a FL. When learning a language, practicing with reading and understanding captions is directly relevant for this goal. By contrast, when learning about a specific topic, apprehending captions is not a goal in itself but only serves the purpose of better understanding the actual content. So, the results of these studies cannot be generalized for the context of content learning in a L1 or content learning in a L2 as captions have a different relationship with the content and the learning goals (van der Zee et al., 2017).

### **3.2 Content learning in a native language (L1) with captioned video**

Since the 1970s, the question of how people learn from video or multimedia instruction has been extensively studied by the field of multimedia learning. One dominant theoretical model in this field is Mayer's cognitive theory of multimedia learning (CTML), which is based on three assumptions: (1) working

memory is made up of a dual-modality (dual coding) input channel system, (2) there is a limited capacity in working memory and (3) that learners engage in active processing. As a result of CTML, countless research studies have sought to examine if learning from verbal and nonverbal representations in a multimedia environment is better for learning than just text or images alone (Mayer & Moreno, 2003). Besides, there has been a plethora of research studies which examined multimedia principles and how it is affected in various conditions and environments. As a result, several multimedia principles have been established, which include but are not limited to the modality, redundancy, and split-attention, cueing, and coherence principles (Ritzhaupt et al., 2015). In particular, the redundancy principle occurs when learners are presented with redundant representations at the same time, for instance, duplicate text and narration. In the context of video-enhanced instruction, this might be manifested by the use of captions in a video with narration (Mayer, 2014; Mayer et al., 2014; Ritzhaupt et al., 2015).

Mayer et al. (2001, 2014) conducted several experiments on the redundancy principle and its effect and as a result, redundancy appears to inhibit learning. In a study on learning from narrated videos, two experiments showed that enabling captions led to lower knowledge retention and transfer. With Cohen's *d* effect sizes ranging from 0.36 to 1.20, the detrimental effects of subtitles in these studies were quite substantial. A range of other studies found similar evidence that for content and language learning alike, narrated explanations are typically better than showing only captions, or narration combined with captions. Finally, some studies showed neither a positive nor a negative effect of captions on learning (van der Zee et al., 2017).

Furthermore, in Ritzhaupt et al. (2015), 147 undergraduate students were exposed to one of six video treatments varying Video Speed and the use of captions in viewing video lectures on the financial aid system. Results show no significant difference on learners' performance across treatments based on Video Speed. Captions were found to have a significant negative effect on learner's performance. A significant difference was found on learners' satisfaction in favour of a normal Video Speed. The findings suggest that learners might be able to accelerate Video Speeds up to 1.5 times the normal speed, but are generally, less satisfied with the learning experience. Or, an alternative explanation is that the captions created a verbal redundancy that overwhelmed the visual channel leading to fewer materials retained and learned (Ritzhaupt et al., 2015). Moreover, the research did not take into consideration the participants' level of language proficiency.

On the contrary, the spatial contiguity principle can aid captioned video comprehension providing the reduction of cognitive load when the captions are placed near the most important points. Mayer argued that deeper learning occurs from a multimedia message 'when corresponding printed words and graphics are presented near rather than far from each other on the page or screen' (Mayer, 2008). Mayer and Fiorella provided details on 22 studies supporting this principle, including one experiment each in mathematics and statistics learning. The authors suggested that the principle is strongest for learners with low prior knowledge, nonredundant text and pictures, complex lessons and interactive formats (Mayer, 2014, pp. 183–200).

Following these ideas, Tisdell and Loch (2017) considered that placing of captions on the screen and displaying some mathematical equations and formulae within the caption may reduce the additional cognitive load that occurs when a student's attention is split between two separate parts of the screen. Their investigation into captioning of mathematics videos undertaken both for native and non-native English speakers at an Australian university discovered that students broadly agreed (98%) that captions are a useful learning feature: to allow flexibility of where and when a video is watched, but also to help understand speaker accents, and clarify explanations that are difficult to hear in the recording. However, the authors studied the students' perception of video use and not the effect on the learning outcomes. As for native and non-native students, there was no statistically significant difference between the mean



level of agreement of usefulness of the captions depending on language background, though closed captions appear to be useful for a whole range of learners.

So, closed captioning of instructional videos is a topic that has not seen much discussion, requires much more research. The authors caution that captions are traditionally created without consideration of cognitive load. They concluded with the best practice of captioned video for all students: captions should be located close to a visual component they describe and that they should not obstruct any mathematical writing (Tisdell & Loch, 2017).

At the same time, the research of Shepherd et al. (2017) poses interest from the instructional design perspective as it questions perceptions of bimodal subtitles<sup>4</sup> as unnecessary and problematizes the popular notion that they are either necessary or unnecessary for a given speaker, showing that a viewer's need for such captions to understand a particular speaker is dynamic and can be significantly reduced through even brief exposure to a captioned video of the speaker in question. Captions have this effect because they provide viewers with an alternate way of accessing the same lexical information that is present (albeit not necessarily readily available) in the audio. In this way, captions do not merely tell viewers what the captioned speaker is saying but rather facilitate perceptual learning of the sound–phoneme mappings underlying that speaker's accent. In a series of two experiments, the authors demonstrated that this perceptual learning can, in a matter of seconds, make the very captions that facilitate it significantly less necessary, potentially creating the illusion that the captions were unnecessary all along—a phenomenon they have dubbed the "subtitle effect" (Shepherd et al., 2017).

### **3.3 Content learning in a second/foreign language (L2) with captioned video**

It becomes apparent that the multimedia and redundancy principles are well established having inconsistent results with the research in a FL learning, however, how do these principles interact with learning when the learning content is presented in a FL?

Mayer and colleagues (2014) based their research on the following assumptions. Students learning academic content in their L2 who have not automated their phonological processing of English sounds may have difficulty in segmenting the incoming flow of sounds into discreet words and therefore must allocate their limited cognitive processing resources to consciously perceiving each word. This depletes cognitive resources needed for deeper processing and thereby detracts from prose comprehension. To support students in perceiving each word, one technique is to add redundant captions to the bottom of the screen, which reproduces each phrase as it is spoken. Adding on-screen captions is intended to preserve word availability, making it easier for students to encode the words. However, from the cognitive load perspective, adding captions can create extraneous cognitive processing— that is, cognitive processing that does not contribute to the instructional objective and wastes precious processing capacity. In particular, extraneous processing is created when learners must split their visual attention between two places at the same time (i.e., the video and the caption) (Mayer et al., 2014).

Based on the previous research on the redundancy effect they proved that when learning in L2, adding redundant captions to narrated video did not result in learning improvements, because of demands for extraneous processing, perhaps because learners did not have available capacity to take advantage of the captions. With this experiment, they created a redundant scenario in which adding captions was neither an advantage nor a disadvantage for students learning L2 in their second language, although the null results do allow for definitive interpretations. An alternative explanation is that the students did not attend to the on-screen text, but this idea could best be tested using eye-tracking methodology (Mayer et al., 2014). In the first instance, it should be noted that much of the research that has explored the use of captions in video-based treatments were in the context of FL learning. Besides, the results of a different set of studies

---

<sup>4</sup> In their research Shepherd et al. (2017) use the term "bimodal subtitles" in the meaning of "captions" that is discussed in section 2.2.

in other subject areas provides evidence that subtitles can also hamper learning, which is in conflict with the prior research on the effects of captioned video on learners' performance in learning a FL, that in most cases, as shown above, proved to be positive except for low proficiency learners (Ritzhaupt et al., 2015; van der Zee et al., 2017). So, further research in examining the consistency of these findings with real online video academic lecture context with professional measurement of language proficiency is necessary.

Furthermore, the framework explaining these conflicting findings by considering the interaction between captions, language proficiency, and visual-textual information complexity (VTIC) was proposed. The authors hypothesized that the effect of captions (L2) on learning outcomes depends on the language proficiency of the student, as well as the visual-textual information complexity of the video. Contrary to this hypothesis, they found strong evidence that there is no main effect of captions on learning (neither beneficial nor a detrimental), nor any interaction, but only a main effect of complexity and language proficiency. These null findings contradict two lines of research, one showing beneficial effects of captions, the other showing detrimental effects. Based on this study it seems that for content videos there is little to no benefit of enabling captions, even for students with low language proficiency and for visually complex videos. Besides, the zero effect of captions put the generalizability of the redundancy effect in question by showing that it does not hold for these specific videos, but arguably also for a wider range of similar videos (van der Zee et al., 2017). Moreover, the effect of subtitles (L1) was not assessed in their study, meaning that providing subtitles (L1) can still have a positive effect on learning and accessibility as proved by numerous researches in FL learning domain. Therefore, more research is needed to further establish the potential (lack of) effects of captions and subtitles on learning from videos not only for comprehension and retention but for the knowledge transfer; both in highly controlled settings as well as in real-life educational settings on various types of educational videos.

### **3.4 Video comprehension strategies: the case of captions**

Video media as complex and unstable blends of image, sound, and production are better understood as a combination of technology, symbol systems, and processing capabilities. The research into how learners interact with video media during the process of comprehension is sparse (Gruba, 1997). E.g., in interacting with cultural video content users developed their functional strategies and were motivated to reach their learning outcomes; cognitive strategies were not always the most effective strategies, and at times might have blocked the development of functional strategies (Caws, 2013).

Though in early studies (Vanderplank, 2016) the students reported positively on watching with captions, the later study (Sydorenko, 2010) reported significant difficulties with watching the videos, such as the speed of the dialogues, lack of time to read all the caption text and the burden of reading captions while watching the videos at the same time.

The unpublished thesis of Zmoon (1996) in a survey study of captioned video viewing among international undergraduate students reported the use of social strategies (interacting with co-viewers while viewing a programme, during a commercial break or after a programme) and individual cognitive strategies: (1) videotaping, (2) replaying the captioned programme, (3) replaying the captioned programme with no sound, (4) resourcing by using various books and (5) writing down something significant. Use of any strategy was limited, with the lower-level groups tending to use more strategies than the higher-level groups (sited from Vanderplank, 2016).

More recent research aimed at answering what the strategies to comprehend video materials are, and what the most and the least frequently used video comprehension strategies (VCS) are in terms of the verbal and nonverbal dimensions, and the three categories (compensation, memory, and cognition) (Oxford, 1990), supplemented by Kintsch's (1998) comprehension theory of multiple-level mental representations and strategic behaviour, found no significant difference between verbal and nonverbal

strategy use among Chinese intermediate students of English watching authentic television news programs. However, for verbal strategies, using video topics and the contextual verbal clues are both ranked as the most frequently used compensation strategies; replaying the video to re-read the captions was the favourite memory strategy, and reading the captions carefully was the most prevalent cognitive strategy. For nonverbal strategies, using concrete situational referents was regarded as the most useful compensation strategy; analysing the video theme was the favourite memory strategy, and catching the main ideas in the clip was the most prevalent cognitive strategy. For verbal strategies, breaking down words into smaller parts was the least used compensation strategy, while listening for every word was the least used memory strategy, and looking up the words in the dictionary, the least used cognitive strategy. Fifth, for nonverbal strategies, observing a speaker's facial expression and body language was the least used compensation strategy, and using domain knowledge gained in academic situations was the least used memory strategy; proposing questions related to the clip was the least used cognitive strategy (Lin, 2011, p. 316).

Though at present there is a number of research reporting the strategies used by L2 learners to comprehend digital video, their results are difficult to be generalized as 1) several studies did not group subjects by proficiency levels; 2) the use of comprehension and vocabulary tests may demonstrate that captions were beneficial and were processed by the learners, but we still do not know how captions are processed by them (Winke, Gass, & Sydorenko, 2010). Thus, the following questions remain untouched. What are the strategies used by native and non-native speakers to comprehend video academic material in a self-learning interactive mode measured by the same questionnaire schema? How the instructional design of video materials could be improved by these research data? Besides, it would be useful to measure the correlation between preferred strategies and success in content learning in a FL context. Moreover, it is necessary to examine the strategy used by online participants in terms of language proficiency.

### **3.5 Learners characteristics and the effect of captions**

As for FL learning domain several recent studies on the effects of learners characteristics on captions/subtitles viewing (Muñoz, 2017; Pujadas & Muñoz, 2019), on the role of instructional interventions like pre-teaching (Montero Perez, 2019) contributed to the results of previous research. For instance, the eye tracking study of C. Muñoz revealed that subtitles may be more appropriate than captions when reading speed is slow. Reading FL text is a harder task for children and beginner learners when their vocabulary size is more limited. Alternatively, captions might be manipulated (shorter length and longer time on screen) but this possibility is not always available to teachers. Adolescents and adults with higher proficiency levels cope better with captions as a way to aid FL learning (Muñoz, 2017). Another example is the Spanish study on the effect of FL proficiency and aptitudes on vocabulary learning outcomes in exposure to captioned video. As a result, four factors – the video content difficulty, the amount of novel vocabulary in the video, the proficiency level of the learners, and their language learning aptitude – may interact, counterbalancing or counter-acting each other. When the four factors are aligned at optimum level, there is strong potential for successful new vocabulary learning. (Suárez & Gesa, 2019) As for content learning in a FL, though van der Zee et al. (2017) proved that the student's language proficiency and the complexity of the video do have a substantial impact on learning outcomes, no main effect of captions was found. Besides, as it was mentioned above, the extent to which captions in the students' native language (subtitles) might help them cope with lacking English proficiency is yet unknown and remains to be investigated.

#### 4. Conclusion

Captioned videos are becoming more common, and sometimes obligatory for content learning because they are more accessible, easy to produce, and fit well into online course offerings, serving a range of students with special needs including those whose first language is not English.

According to the reviewed research results, the effect of captions may depend on the subject area (content or FL learning), learners' language proficiency, learning strategy (if they are used or trained to use captions), captions positioning on the screen, e.g. for math subjects, and video content complexity.

Though the effect of captions (positive) and subtitles influenced by language proficiency (positive for beginners) are well researched for FL acquisition domain, little is known about the effect of captions (negative or null effect so far) and subtitles (no studies) in content learning. Moreover, multimedia principles for learning from captioned video, in particular redundancy principle, must be verified and further researched in an authentic independent online environment.

Therefore, based on the present literature review the research on learning from captioned video-lecture should concentrate on 1) how students process captioned video and how captioned video can help learning process and outcomes in various learning contexts; 2) how the nature and property of captioned video lecture (be it its learning objective, complexity, readability, video structure (e.g. animation, talking head, etc.) interacts with effective retention and knowledge transfer; 3) how student individual characteristics (age, aptitudes, proficiency, learning strategies) effect learning behaviour and outcomes. Finally, the goal of the current review in the domain of effective learning from captioned video lecture delivered in a FL was to promote the high quality of online learning from video content and initiate further research and discussion in video-based learning as a state-of-the-art and perspective technology for distance teaching universities. We think that providing high-quality instructional support for online video lectures' delivery will enhance the demand and contribute to the popularity of distance learning programmes among the multilingual and multicultural audience, thus strengthening European mobility programmes.

We cannot but agree with Australian researchers who state that though the increased internationalisation of education pushes more captioned content in higher education institutions and the potential benefits for various groups of students were illustrated in the available literature, further research is required. While the anecdotal evidence is positive, academic studies have to date yielded inconclusive results (Kent, Ellis, Latter, & Peaty, 2018).

#### 5. References

- Bétrancourt, M., & Benetos, K. (2018). Why and when does instructional video facilitate learning? A commentary to the special issue "developments and trends in learning with instructional video". *Computers in Human Behavior*, 89, 471–475. <https://doi.org/10.1016/j.chb.2018.08.035>
- Chen, C.-M., & Wu, C.-H. (2015). Effects of different video lecture types on sustained attention, emotion, cognitive load, and learning performance. *Computers & Education*, 80, 108–121. <https://doi.org/10.1016/j.compedu.2014.08.015>
- Cross, J. (2011). Comprehending news videotexts: The influence of the visual content.
- Derry, S., Sherin, M., & Sherin, B. (2014). Multimedia learning with video. <https://doi.org/10.1017/CBO9781139547369.038>
- Gruba, P. (1997). The role of video media in listening assessment. *System*, 25(3), 335–345. [https://doi.org/10.1016/S0346-251X\(97\)00026-2](https://doi.org/10.1016/S0346-251X(97)00026-2)
- Guo, P. J., Kim, J., & Rubin, R. (2014). How video production affects student engagement: An empirical study of MOOC videos. *Proceedings of the First ACM Conference on Learning @ Scale Conference - L@S '14*, 41–50. <https://doi.org/10.1145/2556325.2566239>

- Henderikx, P., & Jansen, D. (2018). The Changing Pedagogical Landscape: In search of patterns in policies and practices of new modes of teaching and learning. Retrieved from <https://tinyurl.com/CPLreport2018>
- Hung, S.-T. A. (2016). Enhancing feedback provision through multimodal video technology. *Computers & Education*, 98, 90–101. <https://doi.org/10.1016/j.compedu.2016.03.009>
- Kalyuga, S., Chandler, P., & Sweller, J. (1999). Managing split-attention and redundancy in multimedia instruction. *Applied Cognitive Psychology*, 13(4), 351–371. [https://doi.org/10.1002/\(SICI\)1099-0720\(199908\)13:4<351::AID-ACP589>3.0.CO;2-6](https://doi.org/10.1002/(SICI)1099-0720(199908)13:4<351::AID-ACP589>3.0.CO;2-6)
- Kent, M., Ellis, K., Latter, N., & Peaty, G. (2018). The Case for Captioned Lectures in Australian Higher Education. *TechTrends*, 62(2), 158–165. <https://doi.org/10.1007/s11528-017-0225-x>
- Krathwohl, D. R. (2002). A Revision of Bloom's Taxonomy: An Overview. *Theory Into Practice*, 41(4), 212–218. [https://doi.org/10.1207/s15430421tip4104\\_2](https://doi.org/10.1207/s15430421tip4104_2)
- Lin, L.-F. (2011). The Video Comprehension Strategies of Chinese-Speaking University Students. *Journal of Educational Computing Research*, 45(3), 297–319. <https://doi.org/10.2190/EC.45.3.c>
- Mayer, R. E. (2009). *Multimedia learning* / Richard E. Mayer. Cambridge : Cambridge University Press.
- Mayer, R. E. (2014). *The Cambridge handbook of multimedia learning* / edited by Richard E. Mayer (2nd ed.). New York, N.Y. : Cambridge University Press.
- Mayer, R. E., Lee, H., & Peebles, A. (2014). Multimedia Learning in a Second Language: A Cognitive Load Perspective: Multimedia learning in a second language. *Applied Cognitive Psychology*, 28(5), 653–660. <https://doi.org/10.1002/acp.3050>
- Mayer, R. E., & Moreno, R. (2003). Nine Ways to Reduce Cognitive Load in Multimedia Learning. *Educational Psychologist*, 38(1), 43–52. [https://doi.org/10.1207/S15326985EP3801\\_6](https://doi.org/10.1207/S15326985EP3801_6)
- Monje, E. M. (2016). Students' Engagement in Online Language Learning Through Short Video Lessons. *PORTA LINGUARUM*, 177–186.
- Montero Perez, M. (2019). Pre-learning vocabulary before viewing captioned video: An eye-tracking study. *The Language Learning Journal*, 47(4), 460–478. <https://doi.org/10.1080/09571736.2019.1638623>
- Muñoz, C. (2017). The role of age and proficiency in subtitle reading. An eye-tracking study. *System*, 67, 77–86. <https://doi.org/10.1016/j.system.2017.04.015>
- Pujadas, G., & Muñoz, C. (2019). Extensive viewing of captioned and subtitled TV series: A study of L2 vocabulary learning by adolescents. *The Language Learning Journal*, 47(4), 479–496. <https://doi.org/10.1080/09571736.2019.1616806>
- Ritzhaupt, A. D., Pastore, R., & Davis, R. (2015). Effects of captions and time-compressed video on learner performance and satisfaction. *Computers in Human Behavior*, 45, 222–227. <https://doi.org/10.1016/j.chb.2014.12.020>
- Schwartz, D. L., & Hartman, K. (2007). It is not television anymore: Designing digital video for learning and assessment. *Video Research in the Learning Sciences*, 335–348.
- Shepherd, M. A., Simonian, J. R., & Trussler, L. C. (2017). The Subtitle Effect: How Subtitle-Facilitated Perceptual Learning Can Make Subtitles (Seem) Less Necessary. *Communication Research Reports*, 1–9. <https://doi.org/10.1080/08824096.2017.1356712>
- Shoufan, A. (2018). Estimating the cognitive value of YouTube's educational videos: A learning analytics approach. *Computers in Human Behavior*. <https://doi.org/10.1016/j.chb.2018.03.036>
- Suárez, M. del M., & Gesa, F. (2019). Learning vocabulary with the support of sustained exposure to captioned video: Do proficiency and aptitude make a difference? *The Language Learning Journal*, 47(4), 497–517. <https://doi.org/10.1080/09571736.2019.1617768>
- Sydorenko, T. (2010). Modality of Input and Vocabulary Acquisition. *Language Learning*, (14), 24.

- Tisdell, C., & Loch, B. (2017). How useful are closed captions for learning mathematics via online video? *International Journal of Mathematical Education in Science and Technology*, 48(2), 229–243. <https://doi.org/10.1080/0020739X.2016.1238518>
- van der Zee, T., Admiraal, W., Paas, F., Saab, N., & Giesbers, B. (2017). Effects of subtitles, complexity, and language proficiency on learning from online education videos. *Journal of Media Psychology: Theories, Methods, and Applications*, 29(1), 18–30. <https://doi.org/10.1027/1864-1105/a000208>
- Vanderplank, R. (2010). Déjà vu? A decade of research on language laboratories, television and video in language learning. *Language Teaching*, 43(01), 1. <https://doi.org/10.1017/S0261444809990267>
- Vanderplank, R. (2016). Captioned Media in Foreign Language Learning and Teaching. <https://doi.org/10.1057/978-1-137-50045-8>
- Winke, P., Gass, S., & Sydorenko, T. (2010). The Effects of Captioning Videos Used for Foreign Language Listening Activities. *Language Learning*, 22.
- Winke, P., Gass, S., & Sydorenko, T. (2013). Factors Influencing the Use of Captions by Foreign Language Learners: An Eye-Tracking Study. *The Modern Language Journal*, 97(1), 254–275. <https://doi.org/10.1111/j.1540-4781.2013.01432.x>



## Enhancing ICT Personalized Education through a Learning Intelligent System

### Abdulkadir Karadeniz

ElearnCenter Department, Universitat Oberta de Catalunya, (SPAIN)

Open Education Faculty, Anadolu University (TURKEY)

akaradeniz@uoc.edu

### David Baneres

ElearnCenter Department, Universitat Oberta de Catalunya, (SPAIN)

Computer Science, Multimedia and Telecommunications Department, Universitat Oberta de Catalunya (SPAIN)

dbaneres@uoc.edu

### M. Elena Rodríguez

ElearnCenter Department, Universitat Oberta de Catalunya, (SPAIN)

Computer Science, Multimedia and Telecommunications Department, Universitat Oberta de Catalunya (SPAIN)

mrodriguezgo@uoc.edu

### Ana-Elena Guerrero-Roldán

ElearnCenter Department, Universitat Oberta de Catalunya, (SPAIN)

Computer Science, Multimedia and Telecommunications Department, Universitat Oberta de Catalunya (SPAIN)

aguerror@uoc.edu

### Abstract

In this study, LIS project, developed within the scope of an intelligent learning systems at the Universitat Oberta de Catalunya (UOC), is introduced. UOC has a heterogeneous campus where different specialties (knowledge areas) are taught and it is a fully online university. Therefore, it has a wide range of students with different learning styles. The main objective of LIS project is to develop an adaptive system to be globally applicable at UOC campus to help students to succeed in their learning process. LIS is supposed to be widely applicable to all types of courses and independently of the learning resources and contents. It mainly has predictive analytics, predictive progression dashboard, automated feedback and recommendations, also gamification features designed upon artificial intelligence techniques. Predictive analytics is a model to predict the student's behavior individually and provide personalized recommendations. These automated recommendations will be shown on predictive progression dashboard. The system can provide personalized feedback to students based on the knowledge acquired including exercises, indicators, competencies and learning outcomes. Additionally, rankings, rewards, and badges will be used as gamification tools. All in all, LIS project is planned to meet the needs of learners in online and blended learning environment by implementing many different features mentioned above. In this regard, the focal aim is to present the rationale of the project and share its characteristics.

**Keywords:** Artificial intelligence, intelligent learning system, predictive analytics, recommendation system, gamification.

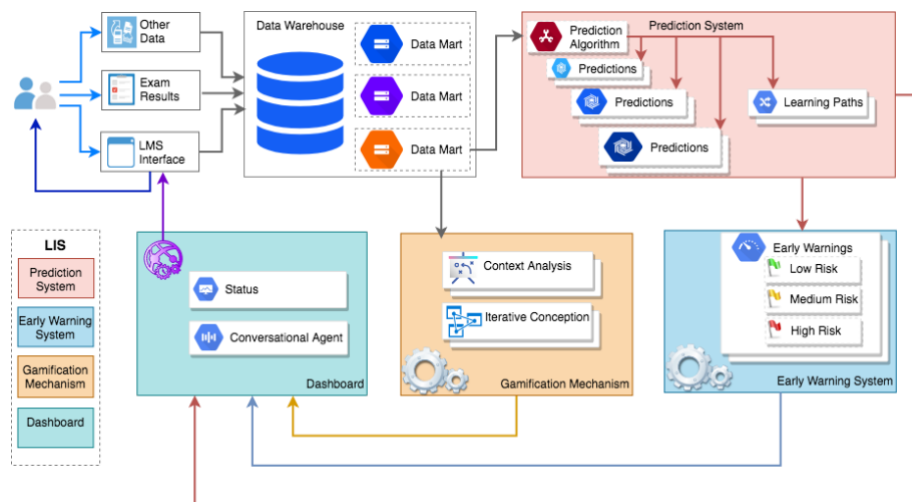
### 1. Introduction

Today's learners generally tend to adopt information and communication technologies support in their learning processes. There are many technological systems that help students to learn. Some of them aid

students in the phase of learning to find learning resources or to recommend exercises. Others aim to help the student in the assessment phase to give feedback. And some others monitor the student's progress during the instructional process to recommend the best learning path to succeed on the course.

As it is mentioned, students prefer using technology not only in access to learning materials but also in the control, monitor and evaluation processes of their learning progress. This demand of learners heads to many technological innovations. Intelligent learning system, especially in this respect, are among the topics most emphasized over the past decade. It is based on adaptation features to increase the user's efficiency. Adaptation can be adjusted depends on user choices to change certain system parameters and adapt their behaviour (adaptable) or systems that adapt to the users automatically based on assumptions about user needs (adaptive) (Oppermann & Rasher,1997) to personalize learning processes.

There are two ways to recommend personalized learning style in intelligent learning systems (Crockett, Latham, & Whitton, 2017). First one is starting with a diagnostic test and learn preferred learning style: perception (sensory-intuitive), input (visual-auditory), processing (active-reflective) and understanding (sequential-global) (Felder & Silverman, 1998) or capture learning styles using a self-assessment questionnaire (Wang, Li, & Chang, 2006). The other one is analysing a student's behaviour within the learning process to predict and recommend a personalized learning style. This way is mainly based on prediction algorithms and usage of artificial intelligence techniques, which is a clear trend to improve performance and efficiency of intelligent learning systems (Sani, & Aris, 2014) by applying artificial intelligence techniques on adaptive feedbacks, recommendation generations and learners' characteristics (Mousavinasab et al, 2018). These trends and suggestions encouraged the authors to conduct this study, in which a software called LIS is being developed within the scope of intelligent learning systems in Universitat Oberta de Catalunya (UOC), UOC has a heterogeneous campus where different specialties (knowledge areas) are taught. The main objective of this project is to develop an adaptive system to be globally applicable at UOC campus to help students to succeed in their learning process. It should be widely applicable to all types of courses and independently of the learning resources and contents. The system (see Fig. 1) will intended to be configurable, and the features should be enabled based on teacher criterion. It is crucial to remark that the LIS system will come with a predefined configuration for all courses. However, it is the instructor of the course that will set up the recommendations available for his/her course.



**Fig. 1.** The overview of LIS architecture

As shown in Fig 1, students' activities, entered by themselves on the learning platform or recorded to the data warehouse depending on their user credentials, are being captured in many ways and kept on the data warehouse (DW). This DW is a large repository of data collected from all actions at UOC. These data are labelled in subsections called "datamart" to meet the need of a certain grouping data. Data mart data can be used by pulling them without damaging the existing infrastructure. This is actually the starting point for this project. Without any harm, LIS components will use data from the data mart to analyse, predict and illustrate meaningful reflection to students.

First, the student data (from their previous actions until last attempts) will enter the prediction algorithm and simple predictions will follow comprehensive ones. At this stage, not only the data will be analysed for predictions, but the learning path suggestions will be created for the learners as well. In the next step, the data obtained from the prediction algorithm will be transformed into different warning levels to trigger awareness. The data of the students taken from the data mart will also constitute the gamification mechanics within LIS. All outputs from LIS components will be transformed into emotional feedback to be expressed by the conversational educational agent to have a positive impact on motivation. Within the scope of the project, as seen in the overview, the main components of LIS includes prediction system, early warning system, gamification mechanism, and dashboard. Sections 2, 3, 4 and 5 emphasizes the characteristics of LIS and its components, while section 6 provides some conclusions.

## **2. Predictive Analytics**

Recommender systems can be routine and provide the same recommendations to all students. However, this is not an appropriate solution. In order to surpass this challenge, it is mandatory to create models to predict the student's behaviour individually and provide personalized recommendations based on predictive analytics. Predictive analytics is a broad term describing a variety of statistical and analytical techniques used to develop models that predict future events. It is depending on existing data. Predictive analytics is used for better understanding behaviours, identifying unexpected situations, and anticipating problems before they happen (Eckerson, 2007; Nyce, & Cpcu, 2007; Gunasekaran et al, 2017).

One of the main contributions of this project is exploring the development of specific predictive models for each type of recommendation. The models will be created based on the data stored in the UOC data mart. These data will be helpful to evaluate and simulate the generated models. For instance, the UOC data mart stores for a student all the grades from previous courses. A model to predict the chances to pass a specific course can be created based on all prior acquired knowledge of the student and all the courses that have passed at UOC.

The accuracy of these models highly depends on the data used to train the models. UOC data mart has reliable data from four semesters. It is assumed that four semesters will be enough to create accurate models.

## **3. Progression Dashboard**

Mainly, lifelong learners such UOC students have limited time to study because of their role in family and in professional work life (Falasca, 2011). They try to minimize the learning time to succeed. Then, they need some insights about the different options to pass the course.

It is proposed that LIS will provide students and teachers with a dashboard based on the Continuous Assessment Activities (CAA) grades. In other words, the student and teachers will be aware of the starting time

of the course and have the chances to pass based on the grades of each CAA. Dashboards are collecting personal information depending on various characteristics of student, their behaviour, habits, thoughts, and interests (Li, Dey, Forlizzi, Höök, & Medynskiy, 2011). It provides graphical representations of the current and historical state to enable flexible decision making (Few, 2006) and give a learner insight into the learner model as a basis to support awareness, reflection, and sensemaking (Kerly, Ellis, & Bull, 2007; Klerkx, Verbert, & Duval, 2017). For instance, assuming a possible development of the system, LIS has different predictive models based on the model explained in the previous section. Model 1 is designed only on prior learning and the passed courses of the student. Model 2 is based on model 1 plus the grade of CAA1. Model 3 is based on model 2 plus the grade of CAA2 and soon. When a CAA is graded, the corresponding model can be executed to obtain the prediction to pass the course. Initially, model 1 is used because no CAA has been graded. Next, model 2 is used when CAA1 is graded and so on. A dashboard can be created based on this information with personalized feedback. Note that, this can be problematic when the system claims that there is no chance to pass the course. This situation should be considered to avoid demoralization with working on psychological motivational feedbacks.

#### **4. Automated feedback and recommendations**

Feedback, educator responses towards learner actions, thoughts, emotions, needs, attitudes, wills, and intentions (Terzis, Moridis, & Economides, 2012), have a meaningful effect on improving the strengths, performance, and to reduce weaknesses (Wilson, Boyd, Chen, & Jamal, 2011) of the learners. Especially, emotional feedbacks are pointed out that they can enhance problem solving and decision-making skills, also help to enhance cognitive processing (Beale, & Creed, 2009).

This research line focuses on improving the supervision of students. Some students have a limited feedback during their learning process and most of the feedback is global at UOC classrooms (i.e. the same feedback for all students of the classroom). Personalized feedback and 24x7 tutoring are always difficult to be delivered. The student may feel alone, even totally lost when they come to an online learning environment. There are many factors, coming from face-to-face learning environments, students with ICT low skill level, etc. Here, LIS will focus on generating semi-automated learning paths and provide these options to succeed to students. Also, it is important to recommend to students the next tasks to perform or even the resources to access. Mainly, all these works will be highly dependable on the data information currently stored in the data mart. After having appropriate data, LIS will reinforce the personalized feedback. These personalized feedbacks are based on the knowledge acquired on each CAA based on exercises, indicators, competences or learning outcomes. Furthermore, the gained information can be later used to gather evidences about the student's acquired competences at degree level. This automation can be done at different levels.

#### **5. My checklist gamified**

Related to the previous research line, LIS can inform students about all the tasks to be performed to pass the course. This information can even be globally aggregated by all the courses where the student is enrolled. Providing a concise schedule may help to increase student's commitment. Here, gamification techniques can be reused to motivate students: Rankings, rewards, badges, among others will be added to the courses. Increasing the feeling to be on a learning community can help to globally success the course. Gamification is effective in increasing engagement especially in online courses (Looyestyn et al, 2017) and gamified learning interventions have a positive impact on student learning (Buckley, & Doyle, 2016). Moreover, rankings help to compare yourself with other students and rewards, and badges to show notoriety within the learning community.

## 6. Conclusion

Intelligent tutoring system is commonly used in courses with a large number of exercises and tasks. The system recommends different sets of exercises based on the knowledge the student is acquiring. Besides, the system tends to assess the exercises automatically and provides automated feedback when the student fails on an exercise. These feedback also could help the teacher to improve course content and structure.

All the outputs of the previous research lines are integrated into a unique system. This unique system will be the tutor that is denoted as LIS (Learning Intelligent System). LIS system will provide information to the student based on their preferences (i.e. conversational agent, nudges, email messages, ... ). It is important to develop automated communication and speech with emotional factors. It is needed to detect the mood of the student and try to increase the morale in negative cases.

LIS will learn students' characteristics and train itself and adapt itself with new learning path recommendation to offer basic activities in education depends on students' performance, and this may help students to find out their proper learning styles. This training will be continuing to help users better than previous interventions. Students also could get additional support from the conversational agent as AI tutors thanks to the early warning system component. The teacher will find more time to focus on teaching, motivation and engagement, while tracing and warning processes are being handled by LIS. Finally, the main aim can be highlighted as "LIS focus on being a system to help students learn better with different and innovative strategies" to reach with this project.

## 7. Acknowledgments

This work was funded by the eLearn Center at Universitat Oberta de Catalunya through the project: New Goals 2018NG001 "LIS: Learning Intelligent System".

## 8. References

- Oppermann, R., & Rasher, R. (1997). Adaptability and adaptivity in learning systems. *Knowledge transfer*, 2, 173-179.
- Crockett, K., Latham, A., & Whitton, N. (2017). On predicting learning styles in conversational intelligent tutoring systems using fuzzy decision trees. *International Journal of Human-Computer Studies*, 97, 98-115.
- Felder, R., & Silverman, L.K. (1998). Learning and teaching styles in engineering education. *J. Eng. Educ.* 78 (7), pp.674–68.
- Wang, H.C., Li, T.Y., & Chang, C.Y. (2006). A web-based tutoring system with styles- matching strategy for spatial geometric transformation. *Interact. Comput.* 18, 331–355.
- Sani, S., & Aris, T. (2014). Computational intelligence approaches for student/tutor modeling: a review. In: *Proceedings of the 2014th International Conference on Intelligent Systems, and Simulation*, IEEE Computer Society, doi: <http://www.Dx.doi.org/10.1109/ISMS.2014.21>.
- Mousavinasab, E., Zarifsanaiey, N. Niakan-Kalhari, S. R., Rakhshan, M., Keikha, L., & Saeedi, M. G. (2018). Intelligent tutoring systems: a systematic review of characteristics, applications, and evaluation methods, *Interactive Learning Environments*, DOI: 10.1080/10494820.2018.1558257.
- Eckerson, W. W. (2007). Predictive analytics. *Extending the Value of Your Data Warehousing Investment*. TDWI Best Practices Report, 1, 1-36.
- Nyce, C., & Cpcu, A. (2007). Predictive analytics white paper. American Institute for CPCU. Insurance Institute of America, 9-10.
- Gunasekaran, A., Papadopoulos, T., Dubey, R., Wamba, S. F., Childe, S. J., Hazen, B., & Akter, S. (2017). Big data and predictive analytics for supply chain and organizational performance. *Journal of Business Research*, 70, 308-317.
- Falasca, M. (2011). Barriers to adult learning: Bridging the gap. *Australian Journal of Adult Learning*, 51(3), 583-590.

- Li, I., Dey, A., Forlizzi, J., Höök, K., & Medynskiy, Y. (2011). Personal informatics and HCI: Design, theory, and social implications. In *Proceedings of the 2011 Annual Conference on Human Factors in Computing Systems, CHI EA '11* (pp. 2417-2420). New York, NY: ACM.
- Few, S. (2006). *Information dashboard design: The effective visual communication of data*. Sebastopol, CA: O'Reilly Media.
- Kerly, A., Ellis, R., & Bull, S. (2007). CALMsystem: A conversational agent for learner modelling. In Ellis, R., Allen, T., Petridis, M. (Eds.), *Applications and Innovations in Intelligent Systems XV: Proceedings of AI-2007, 27th SGA International Conference on Innovative Techniques and Applications of Artificial Intelligence* (pp. 89-102). Berlin, Germany: Springer Verlag.
- Klerkx, J., Verbert, K., & Duval, E. (2017). Learning analytics dashboards. *Handbook of learning analytics*, 1, 143-150.
- Terzis, V., Moridis, C. N., & Economides, A. A. (2012). The effect of emotional feedback on behavioral intention to use computer based assessment. *Computers & Education*, 59(2), 710-721.
- Wilson, K., Boyd, C., Chen, L., & Jamal, S. (2011). Improving student performance in a first-year geography course: Examining the importance of computer-assisted formative assessment. *Computers & Education*, 57(2), 1493-1500.
- Beale, R., & Creed, C. (2009). Affective interaction: How emotional agents affect users. *International journal of human-computer studies*, 67(9), 755-776.
- Looyestyn, J., Kernot, J., Boshoff, K., Ryan, J., Edney, S., & Maher, C. (2017). Does gamification increase engagement with online programs? A systematic review. *PloS one*, 12(3), e0173403.
- Buckley, P., & Doyle, E. (2016). Gamification and student motivation. *Interactive learning environments*, 24(6), 1162-1175.



## Examining the Effects of LMS Use on Academic Performance Using Learning Analytics

### Abdullah Saykili

Anadolu University, Turkey  
asaykili@anadolu.edu.tr

### Aylin Ozturk

Anadolu University, Turkey  
aylin\_ozturk@anadolu.edu.tr

### Evrin Genç Kumtepe

Anadolu University, Turkey  
egkumtepe@anadolu.edu.tr

### Alper Tolga Kumtepe

Anadolu University, Turkey  
atkumtepe@anadolu.edu.tr

### Y. Zafer Can Uğurhan

Anadolu University, Turkey  
yzc\_ugurhan@anadolu.edu.tr

### Abstract

Today, Open and Distance Learning (ODL) technologies allow the storage of a wide range of learning-related data which enable tracking learners' digital footprints. Learners' digital footprints, also referred to as learning analytics, facilitate the development of further understandings into the learning processes through educational data mining strategies. In the industry 4.0 era, when big data on learning processes can be stored at unprecedented levels, the utility of learning analytics to explore and improve learning processes has become a necessity. Therefore, this research aims to utilize such analytics gathered within a higher education ODL context to investigate the relationship between learners' frequency of access to learning management system (LMS) and their academic performance. In this quantitative study, the data were recorded during the 2018-2019 Fall semester and belonged to 20,617 learners enrolled in 592 courses delivered via ODL. Firstly, two learner groups were created as "LMS users" and "non-LMS users". Their mid-term scores were analyzed using two samples z-test. Secondly, four learner groups as "non-users", "low-access", "moderate access", and "high access" groups were created depending on the frequency of access to LMS. The mid-term scores of learners in each group were compared through One-way ANOVA tests. The results revealed a significant difference between learner groups in favor of the LMS users in terms of academic achievement. Also, further significant differences were observed between four groups created depending on frequency of access to LMS. The results and implications for ODL contexts are discussed in the study.

**Keywords:** learning analytics, academic success, educational data mining, open and distance learning, online learning, big data.

## 1. Introduction

Various forms of learning related data can be stored and managed through the new age learning managements systems along with mobile learning tools and other online learning platforms in contemporary Open and Distance Learning (ODL) contexts. These systems enable the tracking of learner online behaviors, thus create digital learning footprints. These digital learning footprints allow revealing unearthed information about the learning processes through learning analytics and educational data mining. In previous times when it was not possible to track digital learning footprints, the tracking of learning related evidence and activity was through limited means and the learning process was generally interrupted to gather such data via self-report questionnaires and course exams. However, learning analytics enable the tracking of various forms of learning associated data in great depth and scope including learner engagement with educational content, with the instructor and with other learners while the learning process continues in its natural flow, without interruption to the learning process (Pardo, 2014). Higher education institutions (HEIs) have particularly begun to utilize learning analytics to assess and evaluate the critical components of learning and teaching processes (Long & Siemens, 2011). On the other hand, researchers have underscored that various fields such as sports, technology, marketing and health have been extensively utilizing associated analytics data, the field of education has only recently begun such endeavor to improve learning processes, and such analytics are not utilized as comprehensively and intensively compared to other fields (Macfadyen, Dawson, Pardo, & Gašević, 2014). The utility of learning analytics to improve learning processes is not an option rather has become a necessity in recent times when the quality and accountability concerns have gained much importance. Also, researchers highlight the necessity of making use of learning analytics in developing deeper understandings of learning habits and behaviors of the ever-more diversified learning population in the 21<sup>st</sup> century (Macfadyen & Dawson, 2012). For these reasons, this particular research study aims to utilize learning analytics to help develop further understandings into learning processes in open and distance learning settings focusing on the effects of LMS use on academic performance using learning analytics.

## 2. Literature Review

Learning analytics is defined as "the interpretation of a wide range of data produced by and gathered on behalf of students in order to assess academic progress, predict future performance, and spot potential issues" (Johnson, Smith, Willis, Levine & Haywood, 2011, p. 28). Another field of study closely associated with learning analytics is educational data mining, which is referred to as "an emerging discipline, concerned with developing methods for exploring the unique and increasingly large-scale data that come from educational settings and using those methods to better understand students, and the settings which they learn in" (Educational Data Mining, 2019). Studies both in the field of learning analytics and educational data mining pinpoint the potentials these two fields hold for the improvement of learning and teaching processes (Baker & Siemens, 2014). Learning analytics and educational data mining procedures help to access further information, report and predict learner related actions. Studies in the field highlight two common uses for the digital learning footprints of learners including 1) predicting learner academic performance and 2) providing effective feedback for learners and instructors within this perspective (Dawson, Gašević, Siemens & Joksimovic, 2014). In addition, other potential purposes for learning analytics include modelling learner profiles, recommending learning resources, initiating reflection and awareness into learning processes, improving social learning environments, detecting undesirable behaviors and identifying learners' affective standings (Tempelaar, Cuyppers, Vrie, Heck & Kooij, 2013; Verbert, Manouselis, Drachsler, & Duval, 2012). Within this perspective, both fields of learning analytics and educational mining assist in handling the educational experience through a more comprehensive and holistic perspective (Pardo, 2014).

As previously mentioned, one of the primary purposes of utilizing learning analytics is predicting learner academic performance. Studies investigating the relationship between academic performance and learning analytics indicate positive correlations between the two (Macfadyen & Dawson, 2010; 2012). Among the examples that utilize predicting learner academic performance is the Course Signal application developed by Purdue University (Mathewson, 2015). This tool detects learners who are at risk of failing a particular course using data tracked within the learning management system (LMS) and student information system (SIS) through data mining algorithms. The application also entails an early-warning system for learners with higher risks of failing a course with the color red. Early studies focusing on the effectiveness of the Course Signal has indicated high prediction capability and high course retention rates as positive educational outcomes (Arnold & Pistilli, 2012). Academic performance prediction and early warning systems development through learning analytics are still an ongoing endeavor. For instance, the Open Academic Analytics Initiative (OAAI) is currently undertaking the development of early warning systems using learning data tracked on Sakai, an open source LMS, and they are also working on portability of these systems for the use of different institutions. The learning analytics collected for these purposes help to detect learners at risk of failing a course, and therefore redirect efforts in taking steps to ensure that learners stay on track of learning objectives such as providing feedback for the improvement of learning behaviors and attitudes (Dawson, McWilliam & Tan, 2008). For these reasons, learning analytics serve not only to provide deeper insights into the learning journey of an individual learner, but also help evaluate the effectiveness of certain educational strategies and programs (Macfadyen et al., 2014). In addition to serving as a means to increase cognitive interaction (Dawson, 2006) and improving the feelings of community building through social networks (Dawson, 2008), learning analytics also contribute to decision making in resources allocation by signposting what resources are utilized by learners and to what extent (Gašević, Dawson, Rogers, & Gasevic, 2016). Dawson et al. (2014) report the following learning analytics data resources are utilized to realize the aforementioned purposes:

- a. Demographics data stored in Student Information System (SIS) including socio-economic status, parents' educational status, and information pertaining to previous educational experiences and etc.,
- b. Learning data stored in LMS and other online learning environments such as the frequency of access, time spent in the online environment, activities undertaken, quiz grades and other online behavior data,
- c. Data sets composed of various combinations of both a and b.

In addition to these data resources, some studies in the field have opted to integrate into the learning analytics self-report data including motivation interaction and affective status (Tempelaar et al., 2013; Tempelaar, Rienties & Giesbers, 2015). However, researchers in the field of learning analytics have yet to reach a consensus as to what learning data is best suited to model learning processes and academic performance (Tempelaar et al., 2015). Therefore, learning analytics studies need to consider inclusion of alternative data resources alongside the data resources reported in the literature to allow for more comprehensive and in-depth learning data analysis. Also, a large majority of learning analytics studies focus on a single course, or a very limited number of courses in a certain discipline (Macfadyen & Dawson, 2010). Data from small number courses and disciplines, in addition to limitations of sampling in these studies, reduce the generalizability of results to wider audiences and different disciplines and contexts, which further complicates the interpretation of learning analytics results (Dawson et al., 2014). For these reasons, this particular study focuses on a large number of learners as its sample enrolled in various courses from various disciplines, thereby this study contributes to shedding light into the unexplored areas of literature in the field of learning analytics.

### 3. Method

This study employs a quantitative cross-sectional survey design, which aims for collection of data at a certain point in time to investigate the variables at hand. For this reason, this research design allows the examination of status of a population or a sample for the variables studied (Creswell, 2012, p.377). The data for this study was composed of learning analytics data (i.e. the access rates to LMS and the frequency of access to the course pages on the LMS) through the learning analytics application of the LMS. The learning analytics data for this study belonged to 20,617 learners enrolled in 592 courses delivered completely through ODL. Fifty-one percent of the sample was female (n: 10,515), and 49% was male (n: 10,102). The mean age was 31.72 (s: 10.55).

In this particular ODL context, print coursebooks as the primary sources of study were delivered to learners and online learning resources such as digital coursebooks in the form of pdf, video and audio course materials in addition to exam preparation materials such as diagnostic tests (pdf), Q&A tests (pdf) and online tests were accessible through the university LMS. Learners also could access discussions forums to interact with the course instructor or other learners in the same course. Also, synchronous course video conferences were held on weekly basis for certain number of courses. Learners in this context logged into the LMS only if they wanted to review the extra study materials, join the synchronous video conferences with the course instructor or participate in the asynchronous discussion forums.

Since this study investigates the effects of LMS use on academic performance using learning analytics, learner LMS access data and learner course access data were used. LMS access and course access data belonging to 20,617 learners enrolled in 592 courses were accessed through the LMS database for the purposes of this study. Since learners were, in most cases, enrolled in more than one course, more than one course access data was generated for an individual learner, thus the final dataset were composed of 119,532 course access data. Learners were classified into two groups as LMS-users and non-users depending on whether they accessed the LMS or not. Also, in terms of frequency of access to the course, learners were classified into four groups as 'non-users' (no access at all), 'low access' (accessed course 1-4 times), 'moderate access' (accessed course 5-10 times), and 'high access' (accessed course 11+ times). The academic performance in this study was operationalized as the mid-term grades received for courses that learners were enrolled in. This data was accessed through the university SIS. Due to the large volume of the dataset, Two Samples Z-Test were used to compare the two groups of LMS users and non-users. Also, One-way ANOVA tests were used to compare the other four course access groups. The parametric tests assumptions were tested before proceeding with the aforementioned tests. Finally, learner groups were compared depending on mid-term grade results, which were presented and discussed in the next sessions.

### 4. Results

Since both Two Samples Z-Test and one-way ANOVA tests are parametric tests, prior to proceeding with these tests data were examined to test whether the assumptions for both tests were met. Firstly, parametric tests require normal distribution of data, therefore the data gathered were tested for normal distribution. The histogram showed that the data in this study was distributed in a way similar to the normal distribution curve. The skewness and kurtosis values for the data were lower than  $-1/+1$  ( $-0.59 - 0.25$ , respectively). These indications confirm that the data was distributed normally, and that data was suitable for parametric analyses.

#### 4.1. Comparing LMS users and Non-Users

Two Samples Z-Test was conducted on data to investigate whether LMS users and Non-Users differed in terms of academic performance. The results indicated a statistically significant difference between the two groups in terms of academic performance ( $z: -66.71$ ,  $df: 133,400$ ,  $p < .001$ ;  $d: .56$ ) (Table 1).

Table 1: Two Samples Z-Test Results.

Groups	n	$\bar{x}$	SD	Z Statistics	df	p	d
Non-Users	13,870	31.11	21.65	-66.71	133,400	< .001	.56
LMS Users	119,532	43.92	23.54				

Table 1 above demonstrates that accessing course on the LMS causes a significant difference in learners' academic performance in terms of their mid-term grades ( $z$ : -66.71;  $df$ : 133,400;  $p$ <.001;  $d$ : .56). Moreover, Cohen's effect size value ( $d = .56$ ) indicates medium significance (Field, 2009, p. 57). Therefore, it can be concluded that learners accessing the course on the LMS are more successful in terms of mid-term scores than those who has never visited the course on the LMS.

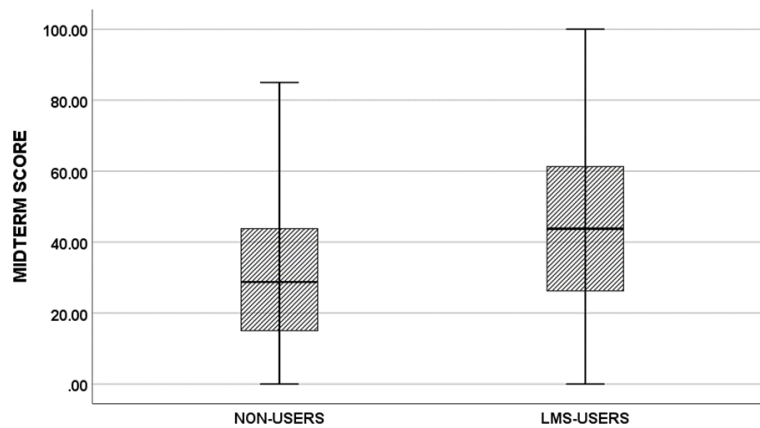


Figure 1: Comparison of LMS users and Non-Users in terms of academic success.

#### 4.2. Comparing groups with various levels of LMS access

One-way ANOVA test was conducted to investigate whether academic performance of learners differed depending on the frequency of access to the LMS. The results of the test showed that equal variances weren't achieved (Levene: 69.06,  $p$ <.001), thus, Brown-Forsythe was used to interpret the significance of the test results (Pallant, 2011, p.253). The results are given on Table 2 below.

Table 2: One-way ANOVA Test Results.

Frequency of Access to Course on LMS	n	$\bar{x}$	SD	F	p	$\eta^2$
No access to course	13.870	31.11	21.65	3252.47 (Brown-Forsythe)	< .001	.066
1 – 4 times	70.526	40.06	22.98			
5 – 10 times	35.170	47.69	23.10			
11+ times	13.836	53.98	22.93			

Results presented in Table 2 above indicate that mid-term results of learners differed significantly depending on the frequency of access to course on the LMS ( $F: 3, 69057; 3252.47; p < .001; \eta^2: .066$ ). Post-Hoc Tamhane test results were examined in order to detect the results were significant between which groups. Tamhane test results revealed significant differences between learners who accessed the course on LMS 1 – 4 times (md: -8.95), 5-10 times (md: -16.58) and 11+ times (md: -22.86). The results also revealed that learners who have never accessed the course on LMS have significantly lower mid-term scores compared to other groups who accessed the course confirming the findings from the Two Samples Z-Test. Also, there were significant differences between learners accessing course 1-4 times and learners accessing course 5 – 10 times (md: -7.62) and 11+ times (md: -13.91). The results revealed that learners accessing the course 1 – 4 times had significantly lower grades than learners accessing the course 5 – 10 times and 11+ times. Furthermore, there were significant differences between learners accessing course 5 – 10 times and 11+ times (md: -6.28). The results indicated that learners accessing the course 5 – 10 times had significantly lower grades than learners accessing the course 11+ times.

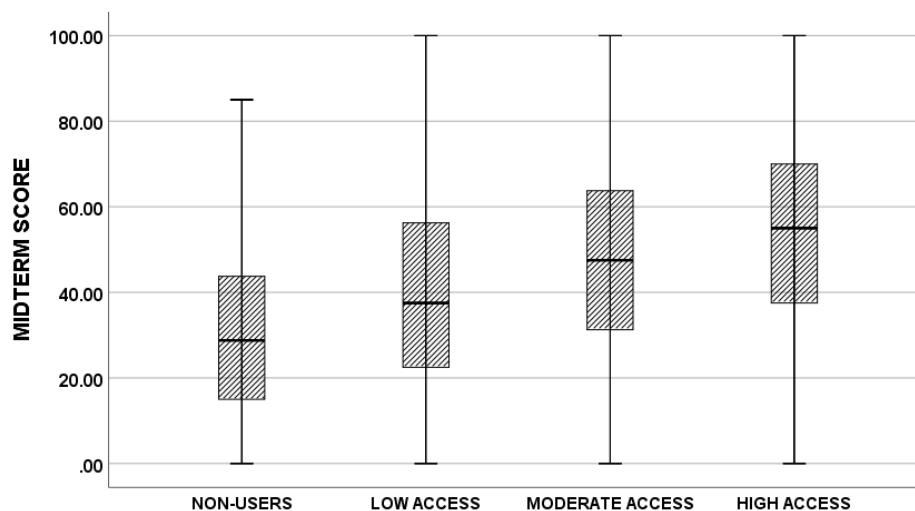


Figure 2: Comparing four course access groups in terms of academic success.

In conclusion, depending on the two samples z test results, it can be concluded that learners accessing the LMS had higher academic performances than those who never accessed the LMS. Also, one-way ANOVA results revealed that as the frequency of access to the course on LMS increased, the academic performance also increased.

## 5. Conclusions

Open and Distance Learning (ODL) technologies in the 21<sup>st</sup> century allow the storage of a wide range of learning-related data that enable tracking learners' digital learning footprints. Learners' digital footprints, also referred to as learning analytics, facilitate the development of further understandings into the learning processes through educational data mining strategies. In the 21<sup>st</sup> century when big data on learning processes can be stored at unprecedented levels, the utility of learning analytics to explore and improve learning processes has become a necessity. Therefore, this research aimed to utilize such analytics gathered within a higher education ODL context to investigate the relationship between learners' frequency of access to learning management system (LMS) and their academic performance. The results revealed that learners who never accessed the LMS on which the courses were delivered had significantly lower academic performance than those who visited the LMS at least once, which indicates that access to LMS might serve as a predictor to academic performance in ODL contexts. On the other hand, the results also demonstrated significant



differences among learners with different level of access frequency to the course on the LMS. The results indicated that as the frequency of access to the course page increased, the course grades increased as well, which suggests that learners with higher levels of access to the course tend to demonstrate significantly higher academic performance. Although the results of this preliminary research into learning analytics and academic performance point to LMS and course access rates as predictor of academic performance, other key learning analytics data such as access to specific course materials, discussion forum visits and postings as well as course video viewing durations should also be taken into consideration when investigating such relation with academic performance.

## 6. References

- Arnold, K. E., & Pistilli, M. D. (2012). Course signals at Purdue: using learning analytics to increase student success. *Proceedings of the 2nd International Conference on Learning Analytics* (s. 267–270). New York, NY: ACM. doi:10.1145/2330601.2330666
- Baker, R., & Siemens, G. (2014). Educational data mining and learning analytics. R. K. Sawyer içinde, *Cambridge handbook of the learning sciences* (s. 253-272). Cambridge: Cambridge University Press. doi:10.1017/CBO9781139519526.016
- Creswell, J. W. (2012). *Educational research planning, conducting and evaluating quantitative and qualitative research (4th edition)*. USA: Pearson.
- Dawson, S. (2006). Relationship between student communication interaction and sense of community in higher education. *Internet and Higher Education*, 9(3), 153-162.
- Dawson, S. (2008). A study of the relationship between student social networks and sense of community. *Educational Technology and Society*, 11(3), 224–238.
- Dawson, S., Gašević, D., Siemens, G., & Joksimovic, S. (2014). Current state and future trends: A citation network analysis of the learning analytics field. *Proceedings of the Fourth International Conference on Learning Analytics And Knowledge* (s. 231–240). New York, NY: ACM. doi:10.1145/2567574.2567585
- Dawson, S. P., McWilliam, E., & Tan, J. (2008). Teaching smarter: how mining ICT data can inform and improve learning and teaching practice. *Annual Conference of the Australasian Society for Computers in Learning in Tertiary Education* (s. 221-230). Melbourne: Deakin University.
- Educational Data Mining. (2019). *Educational Data Mining*. Retrieved 09 25, 2019, from Educational Data Mining: <http://educationaldatamining.org/>
- Field, A. (2009). *Discovering Statistics Using SPSS (Third Edition)*. London: SAGE Publications Ltd.
- Gašević, D., Dawson, S., Rogers, T., & Gasevic, D. (2016). Learning analytics should not promote one size fits all: The effects of instructional conditions in predicting academic success. *Internet and Higher Education*, 28, 68-84. doi:10.1016/j.iheduc.2015.10.002
- Johnson, L., Smith, R., Willis, H., Levine, A., & Haywood, K., (2011). *The 2011 Horizon Report*. Austin, Texas: The New Media Consortium.
- Long, P., & Siemens, G. (2011). Penetrating the Fog - Analytics in learning. *EDUCAUSE Review*, 46(5), 31-40.

- Macfadyen, L. P., & Dawson, S. (2010). Mining LMS data to develop an "early warning system" for educators: A proof of concept. *Computers & Education, 54*(2), 588-599. doi:10.1016/j.compedu.2009.09.008
- Macfadyen, L. P., & Dawson, S. (2012). Numbers are not enough. Why e-Learning analytics failed to inform an institutional strategic plan. *Journal of Educational Technology & Society, 15*(3), 149-163.
- Macfadyen, L. P., Dawson, S., Pardo, A., & Gašević, D. (2014). Embracing big data in complex educational systems: The Learning analytics imperative and the policy challenge. *Research & Practice in Assessment, 9*, 17-28.
- Mathewson, T. G. (2015). *Analytics programs show 'remarkable' results — and it's only the beginning*. Retrieved 11 06, 2018, from EducationDive: <https://www.educationdive.com/news/analytics-programs-show-remarkable-results-and-its-only-the-beginning/404266/>
- Pallant, J. (2011). *SPSS survival manual: A step by step guide to data analysis using SPSS (4th ed.)*. New York: Open University Press.
- Pardo, A. (2014). Designing learning analytics experiences. In J. Laurusson, & B. White, *Learning analytics: From research to practice* (pp. 15-38). New York: Springer
- Tempelaar, D. T., Cuypers, H., Vrie, E. v., Heck, A., & Kooij, H. v. (2013). Formative assessment and learning analytics. *LAK '13 Proceedings of the Third International Conference on Learning Analytics and Knowledge* (s. 205-209). Leuven: ACM. doi:10.1145/2460296.2460337
- Tempelaar, D. T., Rienties, B., & Giesbers, B. (2015). In search for the most informative data for feedback generation: Learning analytics in a data-rich context. *Computers in Human Behavior, 47*, 157–167. doi:10.1016/j.chb.2014.05.038
- Verbert, K., Manouselis, N., Drachsler, H., & Duval, E. (2012). Dataset-driven research to support learning and knowledge analytics. *Educational Technology & Society, 15*(3), 133–148.

## Exploring the Learning Behaviour Patterns of Open and Distance Students

**Aylin Ozturk**

Anadolu University, Turkey  
aylin\_ozturk@anadolu.edu.tr

**Alper Tolga Kumtepe**

Anadolu University, Turkey  
atkumtepe@anadolu.edu.tr

### **Abstract**

With nearly 2 million students, Anadolu University Open Education System boasts almost half of the students at the tertiary level in Turkey. Learning resources presented in the Open Education System are diversified and the learning management systems (LMS) has been renewed in line with the developments in communication and information technologies to better cater for the diversified learner needs. The learning resources distributed across a wide range of platforms have been brought together within the Anadolium eKampus LMS in a holistic manner. Since 2015-2016 students have been provided with a wide range of learning resources and platforms designed for learner-learner and learner-teacher interaction have been developed within Anadolium eKampus LMS which is used by an average of 570,000 students each year. Data regarding Anadolium eKampus login and logout, access frequency, learning resources access and utility as well as resource ratings, and the use of interactive environments have been recorded; thus, digital learning footprints have been tracked ever since. Within this regard, the study attempts to investigate Anadolium eKampus LMS usage patterns of learners. The research will be conducted using data which belongs to students at Anadolu University Open Education System utilizing the Anadolium eKampus for their academic studies during the 2018-2019 academic year. Descriptive analysis of association rules was used to determine the patterns in student learning behaviours, which yielded 8 association rules for learners' course resources access.

**Keywords:** learning behaviour pattern, open and distance learning, learning management system.

### **1. Introduction**

It has always been a challenge to closely observe and thoroughly define learner behaviours in Open and Distance Learning (ODL) contexts (Cerezo, Sánchez-Santillán, Paule-Ruiz, & Núñez, 2016; Graf, Kinshuk, & Liu, 2009). Learning management systems, course management systems and intelligent instructional systems are among the learning environments extensively utilized in ODL, which allow collection of large sets of data that include tracking learner online behaviors and mapping learning paths and processes. Numerous data mining methods and techniques are used in order to unearth disclosed information and patterns associated with learning processes undertaken by ODL learners (Romero & Ventura, 2010). Learners' digital learning footprints are formed analyzing their navigation and behavior on the learning platforms, which will allow acquisition of deeper information with regard to learning processes. Mapping learners' digital learning footprints might contribute to the improvement of learning experiences and their learning performances.

This study aims to map online learning behaviours of learners enrolled in Introduction to Information Technologies I during 2018-2019 academic year. A large dataset of 641,783 course materials access data from randomly selected 20,996 learners using Anadolium eKampus Learning Management System (LMS) has been analysed through data mining methods and techniques for the purposes of this study.

## **2. Literature Review**

McCuaig and Baldwin (2012) attempted to predict learner success using learning analytics data on the Learning Management System (LMS) through data mining methods. They predicted learner academic success using data regarding learners' interaction with course materials in addition to learner self-reports of subject matter confidence. On the other hand, Hung and Zhang (2008) identified learners' behavioural patterns and preferences during learners' online learning processes. Furthermore, they established crucial variables in predicting performance. In addition to these studies, Dung and Florea (2012) offered a new system to predict learners' learning styles. The system they offered was not dependent on any LMS. They used a mapping rule as well as interactions between learner behaviours and learning interaction to understand learning styles depending on Felder-Silverman Learning Styles Model. They compared the results from a course utilizing this method with results acquired through Index of Learning Styles and observed that the proposed method is highly sensitive in identifying learner styles. Cerezo et al. (2016) investigated learners' interactions on Moodle and examined the relationship between these interactions and academic success. The asynchronous interactions of learners, who were grouped according to similar behaviours such as effort, time spent and procrastination, were scrutinized via educational data mining approaches. Later, learners were matched along the lines of different success levels. In another study that used LMS interaction patterns and learner behaviours, Munoz-Organero, Munoz-Merino and Kloos (2009) sought to predict learner motivations. The results confirmed the predictability of learner motivations through their interactions within online learning systems.

In conclusion, the studies in the literature aiming to map online learning behaviours primarily concentrate on various purposes including the determination of learning styles, and prediction academic success and learner motivation (Cerezo et al., 2016). However, these studies were conducted with limited numbers of learners, thereby limiting the predictability of results. This particular study seeks to contribute to the field by involving a large set of data from a large number of ODL learners.

## **3. Method**

Association rules and sequence pattern mining methods of descriptive data mining models were used in this study to map learner behaviour patterns on the learning management system. Association rules is a descriptive analysis that aims to discover the patterns showing strong associations within data (Aydın, 2007). Nonetheless, sequence pattern mining identifies the associations between data in terms of time (IBM, 2011a). In addition, descriptive analyses regarding course material usage were also provided in the results section.

### **3.1. Participants**

The participants in this study were randomly chosen 20,996 learners enrolled in Introduction to Information Technologies I course taught at College of Open Education at Anadolu University during 2018-2019 academic year. Of the 20,996 learners 59% were female (n: 12,335) and 41% were male (n: 8,661). Learners' academic success grades are given on Table 1 below.

Table 1: Learners' academic success grades.

Grades	Number of learners	%
0-24	2,611	12%
25-49	5,670	27%
50-74	9,810	47%
75-100	2,905	14%

### 3.2. Data collection and analysis

The data for this study was accessed through Anadolum eKampus Learning Management System database. After the collection and screening of data, features to be used in analyses were determined. The features and their types selected are presented on Table 2 below.

Table 2: Features used in the analyses.

Feature	Type of Feature
Course Materials Type	Nominal
Course Materials Usage Status	Flag
Course Materials Access Count	Continuous
Course Materials Access Time	Time
Average Academic Success Grade	Continuous
Gender	Nominal

Apriori algorithm was used to investigate the course materials usage patterns of learners in this study. Apriori algorithm re-generates rules from data using an indexing scheme to process large volumes of data (IBM, 2011a). In this algorithm, all data is scanned continuously in order to detect patterns. In this study, Microsoft Excel, IBM SPSS Modeler and Tableau software were used for analysis and visualization.

## 4. Results

This study aims to map online learning behaviours of learners enrolled in Introduction to Information Technologies I during 2018-2019 academic year. A large dataset of 641,783 course materials access data from randomly selected 20,996 learners using Anadolum eKampus Learning Management System (LMS) has been analysed through data mining methods and techniques for the purposes of this study. Table 3 below presents the course materials and learner access counts during the semester.

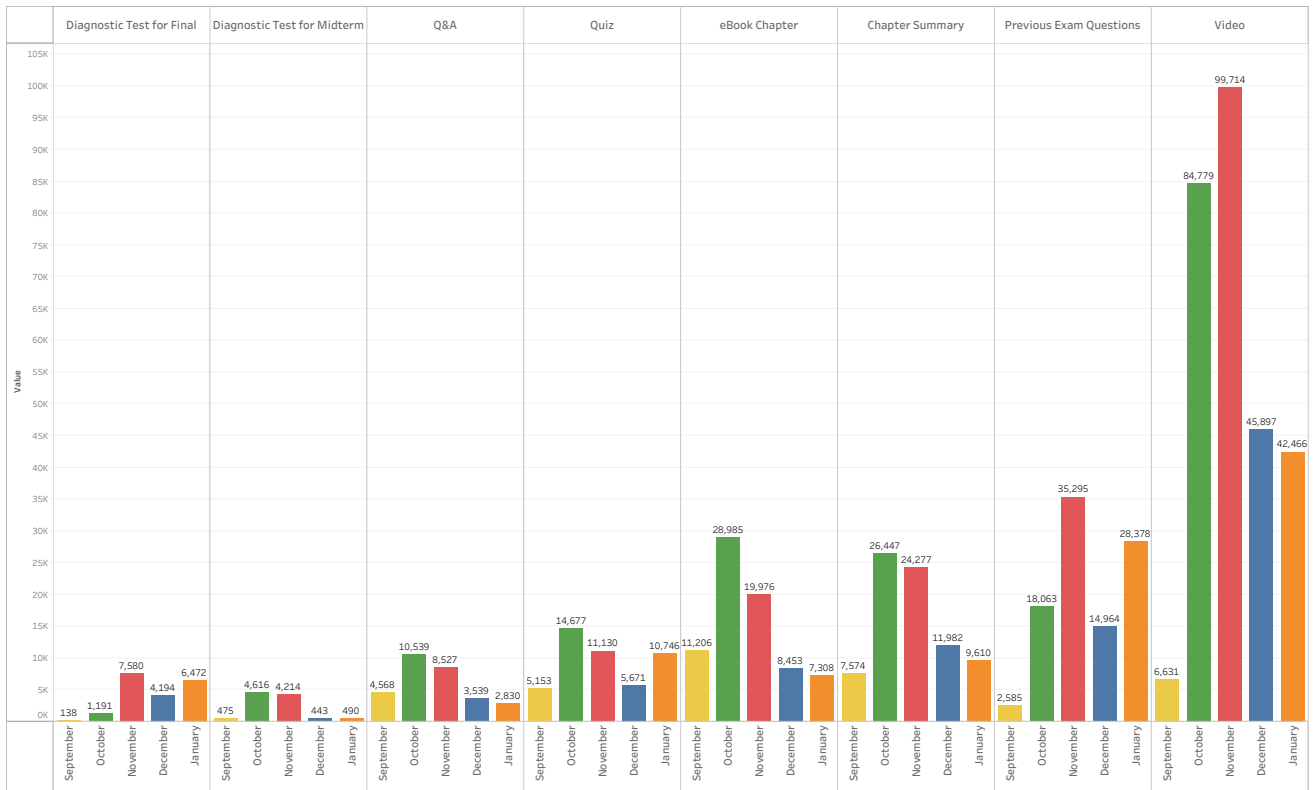
Table 3: Course materials and access counts.

<b>Course Material</b>	<b>Access Count (Total)</b>	<b>Average Access Count</b>	<b>No. of Users Accessing the Material</b>
Video	279,487	36.30	7,700
Previous Exam Questions	99,285	7.80	12,723
Chapter Summary	79,890	6.13	13,042
eBook Chapter	75,928	5.96	12,748
Quiz	47,377	5.68	8,342
Q&A	30,003	4.03	7,444
Diagnostic Test for Final	19,575	3.56	5,491
Diagnostic Test for Midterm	10,238	2.19	4,678

Table 3 demonstrates that the course material the most accessed by the learners is the video materials. However, the concurrent number of learners accessing video materials is fewer than some course materials such as eBook chapter, previous exam questions and chapter summary. In fact, chapter summary is the course material used by the greatest number of concurrent learners. In addition, eBook chapter and previous exam questions were accessed by more than half of the learners.

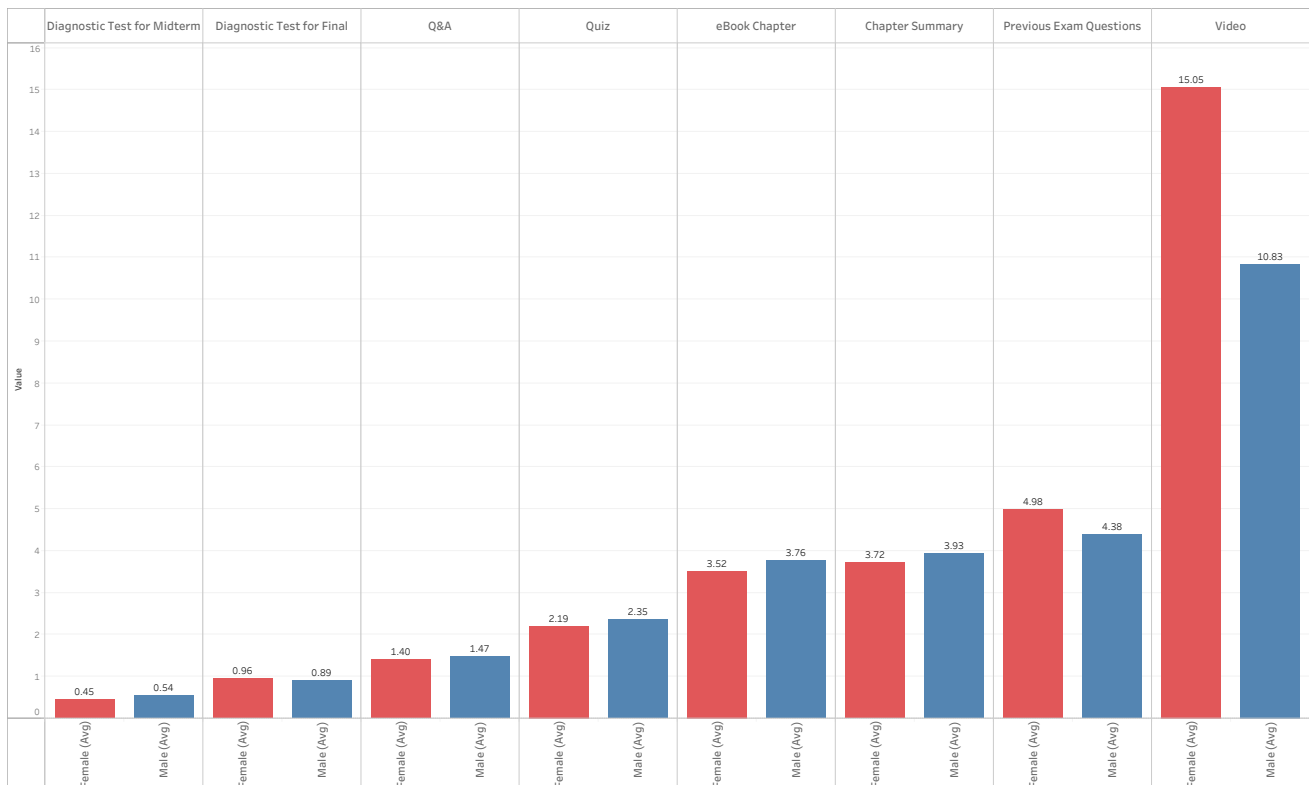
With regards to the date and time these course materials were used, the results revealed that learners accessed the materials 38,330 times in September, 189,297 times in October, 210,713 in November, 95,143 times in December and finally 108,300 times in January. The results show that the highest material access took place in November followed by January, which could be explained by the fact that the exams took place in November and January. According to the results, the materials access counts were higher between the beginning of the semester and the mid-term, whereas during the mid-term and the final exam, there was a decrease in access to materials. Graph 1 below displays learners' access to materials on a monthly basis. Graph 1 shows that Q&A, quiz, eBook chapter, chapter summary and mid-term diagnostic tests were accessed more in October compared to other months. On the other hand, video, previous exam questions and final diagnostic test were more accessed in November. The results also indicate that learners utilized chapter contents and exam-based materials at the beginning of the semester while video and previous exam questions were mostly preferred during mid-term exams.





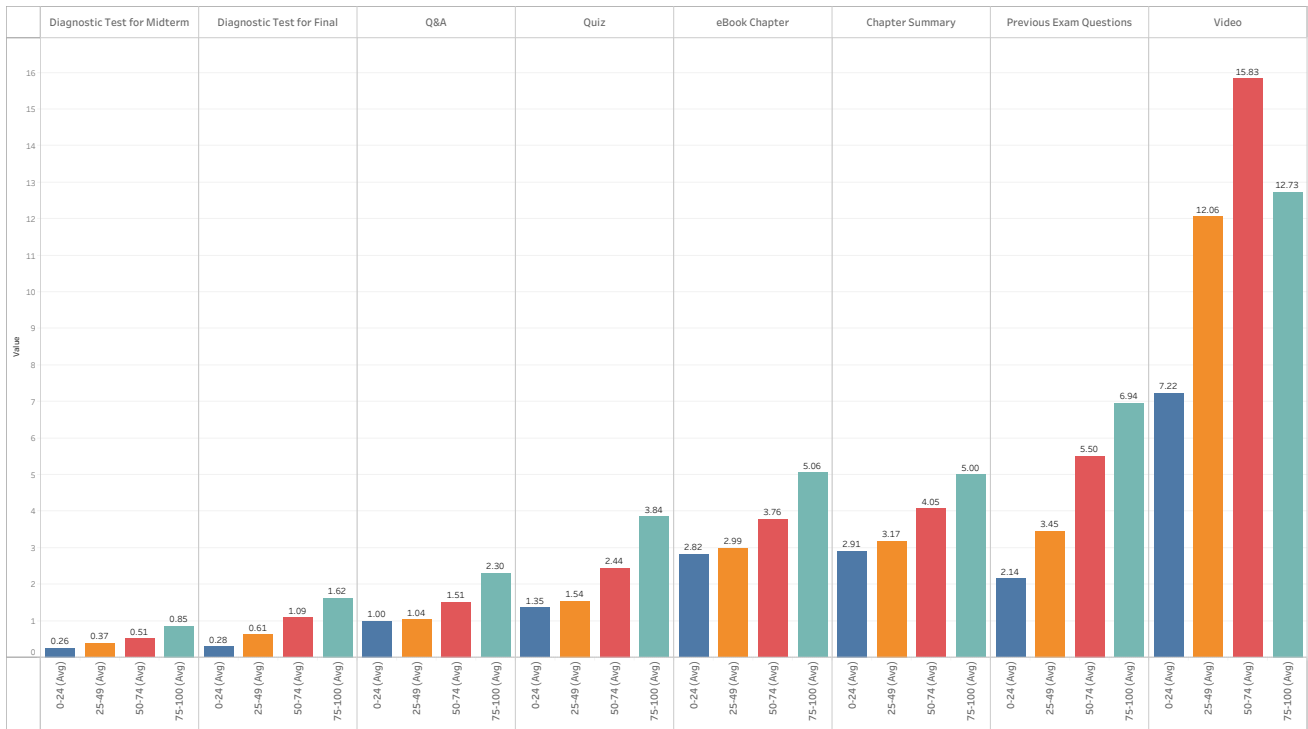
Graph 1. Learners' access to course materials on a monthly basis.

In addition, Graph 2 demonstrates the average access to the course materials depending on gender. While female learners accessed all materials 32 times on average, male learners accessed them 28 times. On average, a female learner accessed video materials 15 times, on the other hand, a male learner accessed this material 11 times. Besides, the biggest access count difference between male and female learners was for the video viewing times. Whereas the average access count to the other materials was almost equal, male learners' access to materials were higher compared to females in general. Video, previous exam questions and final diagnostic test were exceptions in results.



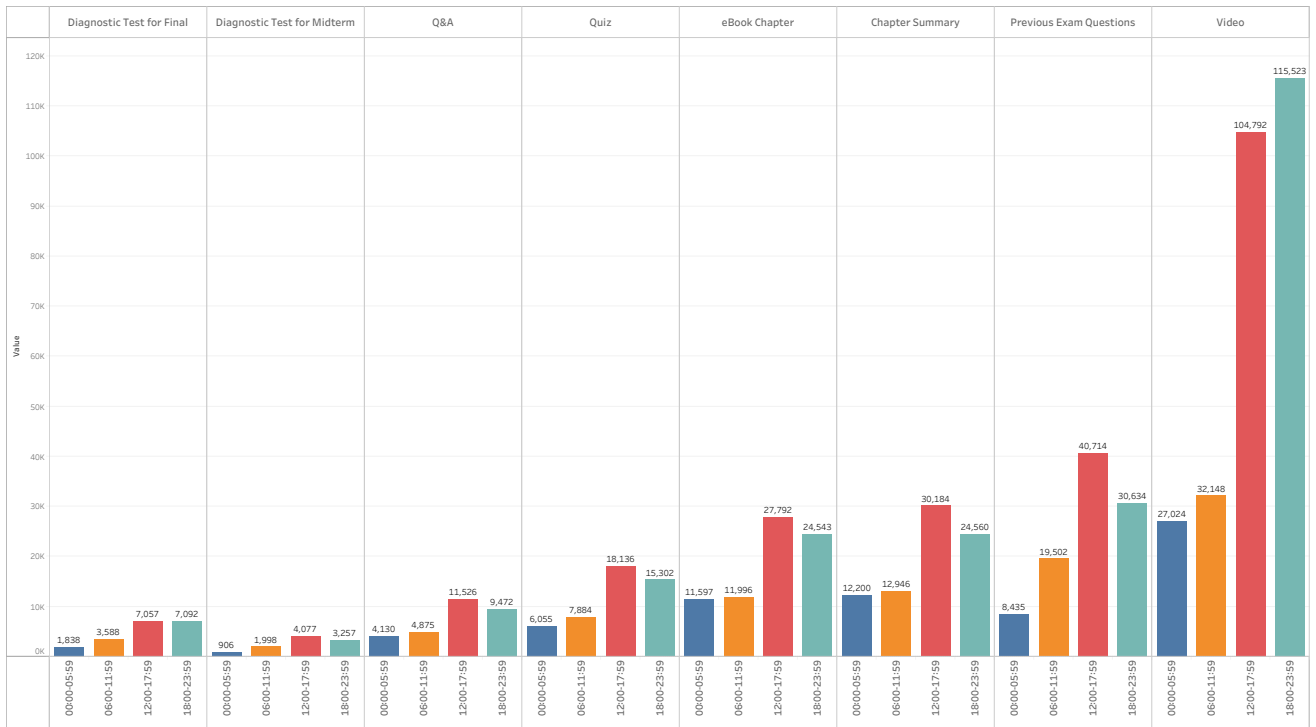
Graph 2. Average access counts in terms of gender.

Graph 3 below contrasts learners' academic success and average course materials access counts. Learners within the 0-24 grade group accessed materials 6.5 times on average, while learners within the 25-49 grade group accessed materials 8.3 times on average. On the other hand, learners within the 50-74 grade group accessed materials 9.6 times on average, whereas, learners within the 75-100 grade group accessed materials 9.3 times on average. The learners with the highest access counts on average were within the 50-74 grade group and the difference was caused by video viewing times. The results also show that as the average access count for other course materials increased as the academic success grades increased.



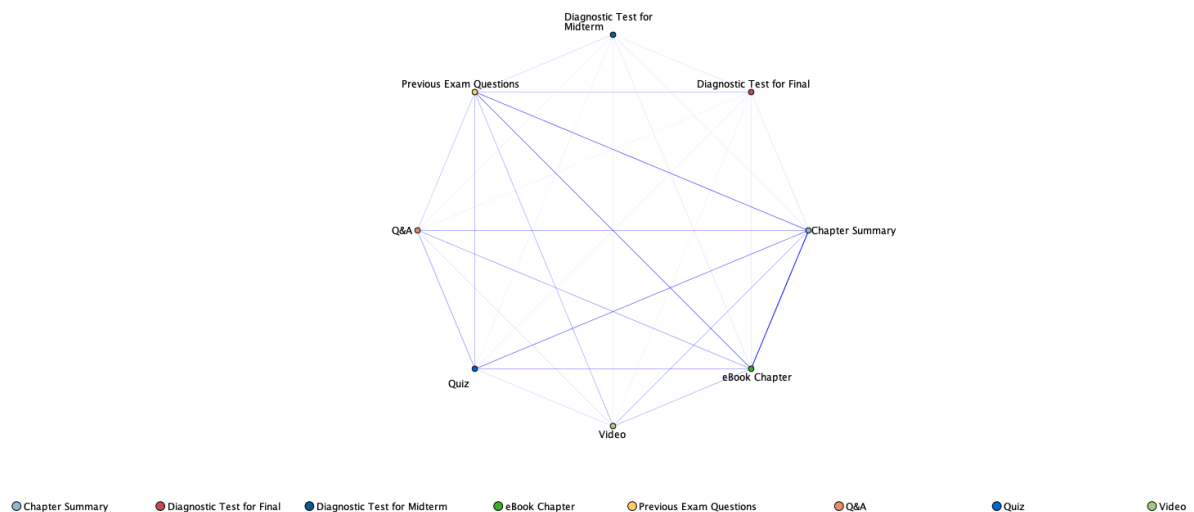
Graph 3. Learners’ average access count for materials in terms of academic success.

Graph 4 presents the total course materials access counts depending on timeframes. Learners accessed course materials 72,185 times between 00:00-05:59; 94,937 times between 06:00-11:59, 244,278 times between 12:00-17:59, 230, 383 times between 18:00-23:59. These results demonstrate that learners accessed the materials the most between the 12:00-23:59 timeframe. The materials, except for video, were accessed the most during 12:00-17:59, whereas video materials were accessed the most in the 18:00-23:59 timeframe.



Graph 4. Learners' material access counts in terms of timeframes.

Association rules were used to identify the patterns showing the most powerful associations in this study. The links between course resources are shown on Graph 5. The darker lines indicate stronger links between resources.



Graph 5. Links between course materials.

Apriori algorithm was used to detect the patterns in learners' course materials access. In this algorithm the minimum rule confidence was set at 90% and the minimum antecedent support value was set at %15. The results revealed 8 association rules, which are provided on Table 4.

Table 4: The results of Apriori algorithm.

Rule Id	Antecedent	Consequent	Support %	Confidence %	Lift
1	Q&A and Quiz and eBook Chapter	Chapter Summary	24.56	93.54	1.51
2	Q&A and Quiz and Previous Exam Questions and eBook Chapter	Chapter Summary	16.54	93.49	1.51
3	Q&A and Previous Exam Questions and eBook Chapter	Chapter Summary	18.99	91.75	1.48
4	Q&A and eBook Chapter	Chapter Summary	28.71	91.51	1.47
5	Q&A and Quiz and Previous Exam Questions	Chapter Summary	19.77	91.42	1.47
6	Q&A and Quiz	Chapter Summary	29.48	91.34	1.47
7	Diagnostic Test (Midterm) and Diagnostic Test (Final)	Previous Exam Questions	15.82	90.67	1.50
8	Quiz and eBook Chapter	Chapter Summary	31.46	90.14	1.45

According to Rule 1, Q&A, Quiz, eBook Chapter and Chapter Summary are observed together in 25% of all course materials access. 94% of the learners accessing Q&A, Quiz and eBook Chapter also accessed Chapter Summary as well. The lift value is a measure of importance of a rule (IBM, 2019). A lift value greater than 1 indicates that the rule body and the rule head appear more often together than expected, this means that the occurrence of the rule body has a positive effect on the occurrence of the rule head (IBM, 2019). According to Rule 2, Q&A, Quiz, Previous Exam Questions, eBook Chapter and Chapter Summary are observed together in 16% of all course materials access. 94% of the learners accessing Q&A, Quiz, Previous Exam Questions and eBook Chapter also access Chapter Summary. According to Rule 3, Q&A, Previous Exam Questions, eBook Chapter and Chapter Summary are observed together in 19% of all course materials access. 92% of the learners accessing Q&A, Previous Exam Questions and eBook Chapter access Chapter Summary as well. According to Rule 4, Q&A, eBook Chapter and Chapter Summary are observed together in 29% of all course materials access. 92% of the learners accessing Q&A and eBook Chapter also access Chapter Summary. According to Rule 5, Q&A, Quiz, Previous Exam Questions and Chapter Summary are observed together in 20% of all course materials access. 91% of the learners accessing Q&A, Quiz and Previous Exam Questions access Chapter Summary. According to Rule 6, Q&A, Quiz and Chapter Summary are observed together 30% of all course materials access. 91% of the learners accessing Q&A and Quiz also accessed Chapter Summary. According to Rule 7, Midterm Diagnostic Test, Final Diagnostic Test and Previous Exam Questions are observed together in

16% of all course materials access. 91% of the learners accessing Midterm Diagnostic Test and Final Diagnostic Test also access Previous Exam Questions. According to Rule 8, Quiz, eBook Chapter and Chapter Summary appear together in 32% of all course materials access. 90% of the learners accessing Quiz and eBook Chapter also access Chapter Summary.

## 5. Conclusions

This study aims to map online learning behaviours of learners enrolled in Introduction to Information Technologies I during 2018-2019 academic year. A large dataset of 641,783 course materials access data from randomly selected 20,996 learners using Anadolium eKampus Learning Management System (LMS) has been analyzed through data mining methods and techniques for the purposes of this study. The results of the study revealed that learners accessed the course materials more between the beginning of the semester and the mid-term exams, however, there was a decrease in materials access between the mid-term exams and the final exams. To prevent the decrease, motivational messages and reminders could be sent to learners to encourage them to study the learning resources. The results also showed that the most utilized course material was the video. However, the course material used by the greatest number of learners is chapter summary. At the beginning of the semester learners study chapter contents and question-based materials while during the mid-term exams they utilize video and Previous Exam Questions. When genders are compared in terms of materials access, women are observed to utilize more learning materials than men. The learners with the highest access counts on average were within the 50-74 grade group. The busiest timeframe for learners to access learning materials was between 12:00-17:59. Furthermore, video access data differs from that of other materials. When associations between materials were analyzed, 8 different association rules were identified. According to the rule with the highest confidence value, 94% of the learners studying Q&A, Quiz and eBook Chapter materials also study Chapter Summary. According to the rule with the highest support value, Quiz, eBook Chapter and Chapter Summary are observed in 32% of all materials access. Moreover, Chapter Summary is the Consequent in 7 out of 8 rules.

## 6. References

- Aydın, S. (2007). *Veri madenciliği ve Anadolu Üniversitesi uzaktan eğitim sisteminde bir uygulama*. Yayınlanmamış Doktora Tezi. Eskişehir: Anadolu Üniversitesi.
- Cerezo, R., Sánchez-Santillán, M., Paule-Ruiz, M. P., & Núñez, J. C. (2016). Students' LMS interaction patterns and their relationship with achievement: A case study in higher education. *Computers & Education, 96*, 42-54.
- Dung, P. Q., & Florea, A. M. (2012). An approach for detecting learning styles in learning management systems based on learners' behaviours. *International Conference on Education and Management Innovation, 30*, 171-177.
- Graf, S., Kinshuk, & Liu, T. C. (2009). Supporting teachers in identifying students' learning styles in learning management systems: An automatic student modelling approach. *Journal of Educational Technology & Society, 12*(4), 3-14.
- Hung, J. L., & Zhang, K. (2008). Revealing online learning behaviors and activity patterns and making predictions with data mining techniques in online teaching. *MERLOT Journal of Online Learning and Teaching, 4*(4), 426-437.



- IBM. (2011). IBM SPSS Modeler 14.2 Modeling Nodes. Retrieved from <ftp://ftp.software.ibm.com/software/analytics/spss/documentation/modeler/14.2/en/ModelingNodes.pdf>
- IBM. (2019). Lift in an association rule. Retrieved from [https://www.ibm.com/support/knowledgecenter/SSEPGG\\_10.5.0/com.ibm.im.model.doc/c\\_lift\\_in\\_an\\_association\\_rule.html](https://www.ibm.com/support/knowledgecenter/SSEPGG_10.5.0/com.ibm.im.model.doc/c_lift_in_an_association_rule.html)
- McCuaig, J., & Baldwin, J. (2012). Identifying successful learners from interaction behaviour. *International Educational Data Mining Society*.
- Munoz-Organero, M., Munoz-Merino, P. J., & Kloos, C. D. (2009). Student behavior and interaction patterns with an LMS as motivation predictors in e-learning settings. *IEEE Transactions on Education*, 53(3), 463-470.
- Romero, C., & Ventura, S. (2010). Educational data mining: a review of the state of the art. *IEEE Transactions on Systems, Man, and Cybernetics, Part C (Applications and Reviews)*, 40(6), 601-618.

## Exploring the use of Facebook in the classroom: The case of a workshop on the history of cinema in Mozambique

### Diana Manhiça

Universidade Aberta, Portugal  
diana.manhica.27@gmail.com

### José Bidarra

Universidade Aberta, Portugal  
jose.bidarra@uab.pt

### Abstract

This paper discusses the use of mobile technologies and social networks in the context of higher education. It states that the integration of teaching and learning methodologies and practices with new social resources are not yet a current and widespread practice in Mozambican educational institutions. In this perspective, the study seeks to contribute to this body of research, analysing the use of digital media and the Facebook social network, during a semester, in the context of a workshop taught in a graduate programme on Film and Audio-visual, in a public institution of Mozambique. This social network resource, consisting of a closed group, served as a facilitator of communication, thematic dialogue and sharing of study material and exercises, between teacher and students, and among students themselves. The study examines practices and habits within a blended learning environment, based on the perceptions of the subjects, reports on the observations and difficulties/satisfaction expressed by the students. It was supported on the analysis of interactions, on a comprehensive field diary and on two questionnaires carried out at the beginning and end of the semester.

**Keywords:** Facebook, asynchronous communication, mobile learning, blended learning, Higher Education, digital skills, mobile devices.

### 1. Introduction

Many of today's students interact with information and communication technologies (ICTs) creatively and collaboratively through personal mobile devices such as smartphones and tablets. Most see them as fundamental components of the world in which they live and are more willing to get involved in the process of telling a story when the result is presented as a multimedia activity (Frazel, 2010). In fact, these users are already telling their own stories on YouTube, Facebook, and many other platforms. When publishing to a different audience, students understand that authoring activities go beyond the school task and consider this is a useful tool in many aspects of their lives. Furthermore, educators can use these technologies to foster their students' learning, creativity and enthusiasm in areas linked to the school curriculum, but also in other areas of knowledge.

While reviewing the literature on this subject, we found several definitions of "learning with mobile devices" (mobile learning). For example, the perspective of Sharples (2000), which defines it as learning that happens

"without being limited to a fixed location and taking advantage of mobile technologies". If we consider the popularity of mobile devices, we realize that most researchers have adopted this definition, which has remained valid since the beginning of the 21st century. Traxel (2009) also defines learning with mobile devices simply as the kind of learning that is supported by a portable or mobile device, and encourages learning through the access to information and management of diverse content (text, image, audio, video, animation, etc.). The integration of these devices into pedagogical models is assumed, according to the same author, as a possible way to increase the effectiveness of learning and these have been used in the past in curricular areas such as languages (Bomar, 2006, Patten & Craig, 2007, Shoemaker, 2007, Moura, 2010), mathematics (Lary, 2004), social studies , Royer & Royer, 2004, Vess, 2006) and the sciences (Roschelle, Penuel, Yarnall, Shechtman, & Tatar, 2005), Tinker, Horwitz, Bannasch, Staudt & Vincent, 2007).

During an investigation carried out in 2009, at the University of Wisconsin Madison, we've found that there are well-defined patterns in the use of mobile devices by students (Bidarra, 2010), namely:

- mobile learning evolves around the social environment of the individual, and not in the classroom (with sharing of podcasts, images, texts and notes);
- learning activities are mainly based on online resources and contact with others (often due to academic work in a group);
- collaborative networks and group work are an important aspect of mobile interaction anytime, anywhere;
- the ease of instantly publishing online content encourages students to become researchers and content authors;
- the ability to easily capture, record, and publish multimedia transforms students into producers and critics (for example, interacting on Facebook or YouTube).

Currently, due to the massification of portable devices, it makes sense to consider the integration of mobile learning into systems managed by students, allowing them to choose digital tools, set personal goals, control content and communicate with each other autonomously. These personal learning environments are made up of various elements, which can include social networks, virtual worlds and open tools (Google Docs, Skype, YouTube, etc.), interconnecting various learning resources that may be appropriate to the pedagogical contexts and the knowledge to acquire by each individual student.

In this ecosystem, the teacher has to take an attitude of openness, always trying to build with his students the sense of acquiring knowledge, organizing and creating learning situations with the new technologies, evaluating them on a sustained way, implying them in all steps of the process, respecting and valuing their individual differences, coordinating the whole formative path and, finally, reflecting on the pedagogical practice. On the other hand, the teacher must also possess and develop a set of skills that require a range of new competences, knowledge and attitudes. Many developed countries have already defined and adopted what they consider as the set of teachers' digital competencies. (UNESCO, 2009; INTEF, 2017; Lucas & Moreira, 2018).

"Both in-service professional development programs and future teacher preparation programs should provide appropriate technology experiences at all stages of training." (UNESCO, 2009, Introduction)

In view of the current teaching practice in Mozambique, we support the need for investment and planning of teacher education in digital technologies, and we believe that it should occur both through the implementation of public policies and programs offered by the institutions themselves, and by way of teachers own initiative, at all levels of education.

## **2. Digital media and social networks in an educational context**

Considering that traditional learning is extensively based on memorizing knowledge and performing evaluation activities, today there is a change, and games, simulations, virtual environments and augmented reality have become ideal platforms for scientific experimentation, and for the most varied forms of (inter)active learning.

The relationship between technology and pedagogy has also changed substantially and must be considered in the light of the latest developments in educational technologies, which allow us to break with the tradition of a directive education, exclusively based on the "recommended manual", on the teacher's dominance as "source of knowledge" and in the observance of an "established curriculum".

However, it can be seen that the current pedagogical model in universities and schools continues to be essentially teacher-centred and based on one-way communication. This practice runs against the thesis that students learn more when they collaborate with teachers and peers in the context of educational narratives (Pachler & Daly, 2009). Today, evidence shows that a new, student-centred, personalized, collaborative model of networked education is emerging, one that seeks to create mechanisms through which unique experiences and rich environments are established (Shaffer, 2004).

It is also important to consider that the learner has become an active player, capable of expressing a critical opinion about what he sees, able to select what he wants to see and to create his own content. These are innovations that derive from the emergence of a new society, networked, in constant interaction, fast in the decisions, globally informed and based on the integration of several digital media, with narratives appropriate to this new context (Oliva, Bidarra & Araújo, 2017).

Nowadays, digital media in support of learning acquire multiple forms, in many cases with advantages for project-based teaching, for example, using available software for the recording and editing of sound and video, for the treatment and cataloguing of still images and to share this content. Ideal options would be: Twitter for quick messaging and Facebook for all types of networked media; synchronous communication systems such as Skype, interesting for group and project work; and search engines such as Google or Bing. With all this support available, students, individually or in groups, can create, edit, publish, share, communicate, as long as there is time and opportunity.

In the context of this study - focussed on a Film and Audio-visual Degree - the use of professional software for the production of teaching content is frequent, for example, Adobe Premiere and Final Cut Pro video production suites. This is usually made available by the institution or by a wider circle of amateurs and professionals. It is also frequent to use social networking groups to support communication, information

sharing and quick messages between peers and teachers, the most popular among young students being WhatsApp.

Although e-learning platforms today represent a secure investment for educational institutions, they constitute an overly closed environment, and in the context of developing countries (like Mozambique), financially challenging for the institutions' budget. There is, therefore, the need to expand this environment through social networks such as Facebook, free of charge and offering spaces that extend the classroom (Niu, 2017), but having both risks and opportunities for educational processes (Gómez et al., 2015).

Some authors (Fogg et al., 2013) developed resources to guide teachers in the use of these tools in education, describing some of the main features of Facebook while advising the educational community. Others (Gómez et al., 2015) identify risks and opportunities, presenting a "guide with recommendations and considerations" and indicating a series of data protection measures, in addition to general recommendations for teachers. In the context of higher education in Mozambique there is also an article by Gamito (2018) about his research carried out at the Pedagogic University of Maputo, which is the only work we have identified about the use of the social network in the same context.

In our case study, the decision to use Facebook was made based on its popularity among students as a social networking system (Gómez, 2015; Niu, 2017), and because the teacher intended to establish a virtual communication space beyond the classroom allowing for "anywhere and anytime" access. In this sense, our study sought to contribute to the corpus of research on the use of social networks in the Mozambican context, presenting a qualitative reflection based on direct observation and in class records, but also on data analysis of the initial and final questionnaires of the semester.

### **3. A Case Study in Mozambique**

#### **3.1 Context**

Mozambique is a developing country with an estimated 28 million inhabitants, the most recent data published on the site NapoleonCat.com indicate 2,409,500 registered Facebook users in December 2018. These data indicate that less than 10% of the population uses this service. Of these, 38.8% are between the ages of 18 and 24 and 28.2% between 25 and 34 - making it possible to state that it covers the population of higher education students - with an internal distribution of 62, 1% of men and 37.9% of women.

Our study was carried out in a public institution of higher education in the surroundings of the capital - Maputo - during the first semester of the academic year of 2018. The object was a class of 23 students (3 female) enrolled in the 3rd year of the degree on Cinema and Audio-visual, an undergraduate course with a total duration of 4 years. This same year, the degree graduated its first class.

The practical course (workshop) used for the study was called "Introduction to the Co-construction of Film History(ies) in Mozambique" and essentially addressed issues of "history" as a constructed narrative of memory, collaborative and democratic processes. The subjects' (students) perceptions about the use of active methodologies, digital tools and mobile teaching-learning resources, was the object of our research, which took place during the 16 weeks of the workshop, the whole duration of the semester.

### 3.2 Methodology

To provide support for teaching and learning processes requiring a new posture and a new relationship with knowledge (Diesel et al., 2017), we created a "restricted group" on Facebook (Gámez et al., 2015) to facilitate communication between teachers and students. This was also intended to facilitate and stimulate communication, collaboration and debate among students about the themes and exercises proposed, in a space and time external to the classroom (Saxena & Majumdar, 2015). The creation of the group would extend the space-time interaction of the classroom, and this would have advantages for a collaborative learning process.

We also estimated that it would allow for the regular use of mobile learning within the context of flipped classroom or inverted class methodologies (FLN, 2014), as well as other active pedagogies "beyond the simple use of new technological resources", for which "planning and organization of learning situations should be focused on the activities of students", occupying "the center of educational actions" (Diesel et al., 2017), through reflection and collaborative work - much like the modus operandi of film production crews.

Having started the workshop, students were informed of the plan and guidelines for the use of the Facebook group (Gámez et al., 2015) and added their previously existing individual profiles.

### 3.3 Empirical study with Facebook

As exposed by Gamito (2015), we could also observe that Facebook is not commonly used by the institution's teachers for teaching and learning activities. But it turns out that a lot of teachers use *WhatsApp* class groups, for general communication and information.

The *Facebook* group had 28 elements, from which 23 were students, 1 teacher / researcher, and 4 faculty and course direction. Created on March 7<sup>th</sup>, 2018, it was in activity between that date and June 5<sup>th</sup>, when the semester ended.

To analyse the interactions in the closed Facebook group, we defined a macro structure: Introduction and Blocks 1 to 9 (table 1). A total of 159 posts were reviewed. Next, we analysed these interactions according to three criteria: the authorship and initiative of the posts, the typology of their content and the typology of the reactions, these being subdivided into *views*, *likes* and *comments*. We considered both Teacher's posts (TP) and Students' Posts (SP).

Table 1: Facebook posts characterization table. TP (Teacher's posts) and SP (Students' Posts)

BLOCKS	TP	SP	DATES
Introduction	4	0	7th to 9th of March 2018
Block 1	4	10	12th to 22nd of March 2018

Block 2	2	15	23rd to 30th of March 2018
Block 3	5	18	29th of March to 6th of April 2018
Block 4	3	22	11th to 19th of April 2018
Block 5	2	14	20th to 27th of April 2018
Block 6	3	15	30th of April to 9th of May 2018
Block 7	4	16	11th to 28th of May 2018
Block 8	12	7	25th May to 2nd of June 2018
Block 9	3	0	5th of 8th of June 2018

The duration of each block allowed us to identify a weekly structure of interactions, which corresponded to the structure of the workshop itself and guided all planned tasks and exercises. Blocks 7 and 8 had, respectively, a longer duration and a greater number of TP, since these included practical group interview production and editing activities, and some posts referred directly to the organization of production and the sharing of audios and photos.

Describing the TP, 12 out of 42 can be classified as flipped classroom initiatives, with the introduction of themes and supporting materials for further development in the classroom. The remainder being attention calls to meeting deadlines, citing of sources and spelling of mistakes. Most SP are uploads of written work files and some are requests for tips for the use of certain computer tools such as PDF converters, spell checkers and access to shared links.

In general, all the interactions on Facebook were asynchronous and the platform's synchronous communication tools - written chat / audio / video - were not used.

### 3.3.1 Posts authorship and initiative

We may conclude from the group's observation that each block has one "opening post" (or more) by the teacher, followed by a series of student posts, usually close to the number of students in the class, and a "closing post" by the teacher.

Out of the total 159 posts, we can point that 42 are authored by the teacher / researcher and the remaining 117 by the students / research subjects. Almost all the SP are reactions to an assignment, submission of written exercises or reflections, originating in the said "opening post". There was one single autonomous SP, not in response to a TP, just the video sharing of the group work (edited interview file). We also found that was better to organize the authorship category into authorship / initiative and authorship / creativity. In the first case, when the author of the post shared a content from another author - for example, when they shared videos



links - and in the second, when the content of the post was original. Some, of course, were mixed-category posts.

In this sense, if the SPs were characterized by the submission of written exercises, all these would be categorized as original. Otherwise, most of the TPs were links to content and attachments with bibliography from various authors and the Film Museum project itself. This evidence is in line with the planned strategy of student-oriented teaching, in which the teacher plays the role of a facilitator between students and content.

### **3.3.2 Posts' Content Typology**

Since almost all SPs were submission of proposed tasks' materials, we would say that there was a relatively passive relationship between the students and the tool. There were few or none direct interactions between students and the only situation where the group was used for organizing collaborative activities was for the group interview exercise.

We divided the content typology into:

- a) text;
- b) text file attachment;
- c) audio;
- d) video;
- e) image or photo;
- f) link to external site;
- g) others.

Observed typologies involved four types of content - text, image, video and audio - that appeared in isolation or combinations. For example, SPs that are exercises' submissions often only include the attachment file without any introductory text, while others are merely photos of group activities.

On the contrary, the TPs usually used a combination of kinds of content, with explanatory introduction text for the proposed exercise, often with external links (videos tutorials and complementary tools, support software) and, on one occasion, using Facebook's survey tool to collect students ongoing perception about the methodology itself.

### **3.3.3 Reactions to posts**

Reactions were classified and described according to three main types: views, likes, and comments. In general, it is possible to conclude that the likes were reactions more common to posts that contained fixed visual elements, namely images or photos. Views were the most common type of reaction, with the initial posts of each block often having a number of views almost identical to the number of students in the class. Posts about the group exercises also had a high number of views while posts for individual exercises had fewer views (less than 4). Finally, comments were the typology that provided us with more detailed information and data about the perceptions of the subjects. They were sometimes longer texts. In the study we could observe that they were, most times, requested by the teacher.

During the last few weeks of the workshop we asked for reflective comments on the tools and methodologies used during the semester. In this case, the students made suggestions on ways to improve the use of a quizz game. Each suggestion / comment was followed by a teacher reply. In summary, students' suggestions were about the games' countdown settings and suggestions of different levels and age groups targeted content. In this case the subject was the interdisciplinary character taught in collaboration with external faculty.

Students also reflected on the lack of practice centred activities that characterize the course and the importance of shared experiences of real film shooting and editing situations. This kind of reflective activity could also provide a method for evaluation of teaching practices and institutional management practices.

Reference literature (Manca e Ranieri, 2013; UNESCO, 2008) usually indicates speed and ease of access, rapidity of teacher's response, information sharing, interaction, innovation, mobility, collaboration and participation, favouring community culture, informality and user friendliness as some of the characteristics of Facebook associated with education. For some authors, the platform also compensates for the lack of moments and spaces of face-to-face interaction (Abeywardena, 2011), which are sometimes characteristic of the curricular organization. But the same literature also informs us about the main conditioning factors, such as concentration difficulties due to hypertextuality, and the lack of privacy in social networks.

In the experience reported in this paper, the teacher could verify some of the most positive characteristics. Because the institution does not have a VLE it turns out Facebook is allowed to fill in for its absence. On the other hand, the time of interaction and knowledge construction, reduced to a weekly face-to-face 2-hour class, was extended, allowing for more curricular themes and greater student-teacher, student-content and student-student interaction (Moore, 2011).

From the challenges point of view, we could verify that the socio-geographical data access issues in the city of Maputo have a direct impact on the students' experience, making their perceptions about the tool somehow oscillate. We felt the need for prior training in the use of tools that facilitate the use of mobile technologies and social networks in teaching. This we did not anticipate would be important to the students.

This was a pioneering experience in that institution, which imposed a slow learning curve from the start. However, we believe that one of its main achievements was to stimulate reflection about the opportunities that networking tools and mobile technologies offer to the teaching community. The advantages that can be drawn from them also means a challenge for teaching institutions policies: academic, faculty, logistical, tool development and others.

Our perspective has been to continue collaborating in this direction, providing a greater number of experiences and deepening the initiated research. We argue that in-service teacher training is a fundamentally important element to develop the reflection about practices, and a factor for changing traditional attitudes and behaviours towards the effective use of social networks and mobile devices in teaching.

### **3.3.4 Preliminary questionnaire: data collection and analysis**

Two questionnaires were developed, structured around groups of mixed open, closed and multiple-choice questions. Both were printed and filled in the classroom, with the supervision of the teacher / researcher.

Since the respondents were the exact same group as the workshop group, an effort was made to avoid a low response rate (frequently reported for many online questionnaires). The themes of the questions followed the trends of other similar studies, adapted to the new context. Authors Gonzalez et al. (2016) point out the most frequent themes related to positive impacts of the use of social networks for learning: collaboration, interaction, satisfaction and motivation. Also, they indicate some of the negative impacts to consider: attention / distraction, privacy and trust.

The preliminary questionnaire (PQ) was submitted at the beginning of the semester, before performing any learning activities involving digital media and social networks, with the purpose of characterizing the group, their habits and general perceptions. It was answered by 18 students, in a non-compulsory manner.

The data collected indicated that about 89% of students have mobile devices (MD), both smartphones and/or laptops, and use data services over mobile telephony. Two students had phones that could not access internet and they used university desktop PCs. Students confirmed there were free internet access spots on campus, but about 80% acknowledged that they were not informed about any institutional policies regarding use.

As for the regularity with which they use mobile devices in everyday life, 87% of students said they use it more than once a day in at least one of their MD, and 72.2% said they use the internet with the same regularity. These data confirm that mobile technology and network access - although we do not have data on other dimensions of use - are daily actions for the vast majority of students, at least in the context researched.

Although there were initial doubts about the stability and internet speed within the campus, during all the 2-hour face-to-face classes held during the semester, and despite some power and viruses' events, everything was very much functional. The Library is still the place indicated by two thirds of the students where the use of the internet is more frequent, and 5 students refer the use in public transports.

As to whether teachers use or suggest the use of digital content, half of the students stated that some teachers do it, and that text and digital books (.pdf) are the most used type of such digital content, followed by videos (movies and tutorials).

### **3.3.5 Final questionnaire (FQ): data collection and analysis**

The 17 students who answered the Final Questionnaire (FQ) were the same (minus one) who answered the first questionnaire. This comprised a group characterized according to an age span 19 through 41 years old.

The FQ was also filled in the classroom, in the presence of the researcher, anonymously, each one being randomly assigned letters A through Q. With a total of 47 questions divided into 6 groups (the last one being on the use of digital games, a topic that will not be analysed in this paper). Two groups of questions provided us with specific data on the habits of both students and teachers, regarding the use of digital accessed content and tools, in teaching-learning practice, in the classroom and for autonomous study.

Essentially, we gathered evidence that all students have MD with Internet access, that this access is not of the best quality - stability and bandwidth - and that most use the mobile data service from telephone providers, for some an expensive and unreliable service, not having access to personal wi-fi connections. Because of this, on campus, the preferred access points were the Library and the Computer Room, where students had free

but limited connections (no downloads are allowed) through desktop computers. This shows that access is still seen as a complementary resource, for occasional use, with many budgetary and content limitations.

According to students, the most common places for the general use of MD with internet connection - including smartphones and laptops - are the home and the college campus, with 35% saying that classroom use in learning activities is rare, despite teachers suggesting the use of digital content materials on a regular basis. Cultural centres and public transports come in third and fourth place as where students use online connections. The weekly average usage of the internet for learning purposes as indicated by the students shows over 76% of responses between 1 and 5 hours, the second largest group being between 5 to 10 hours.

The social media most used for learning and study activities are: Facebook, YouTube and WhatsApp. Google is the preferred search engine. Wikipedia is used for general information and e-mail as the most common communication tool. These numbers bring Facebook to the top and the usage made seems to have had great impact on the way the students in this group learn with it. Regarding teachers' use of social media to communicate and develop learning activities, almost two thirds of students indicate that less than 3 teachers do it on a regular basis and as a prearranged methodology.

Finally, a couple of more specific questions asked about the use of a closed group on Facebook as a complementary methodology to the classroom time-space, and 11 students (65%) indicated using their own MD, while the remaining 6 used college equipment, namely desktop computers. From the perspective of a study on "mobile learning", we could say that one third of the class was not always mobile (connected).

Students also pointed out that they consider using Facebook as being a motivating (53%) and very motivating (47%) tool for the introduction and development of curricular activities outside the classroom interactions.

In an open-ended question, asking for individual suggestions to improve the conditions for Facebook use in the context of a curricular activity, the comments were not conclusive and suggest the need to carry out individual interviews, which could complement the answers providing extra indicators of the subjects' perceptions and motivations.

However, we can highlight some of the general ideas summarized from the comments received that we consider to confirm our own observations, and suggest useful and simple ways to implement improvements.

Students suggested:

- that other courses and other schools should adapt this communication model for learning activities, including a weekly task schedule with notifications that serve as reminders;
- that peers should be more constructive on comments made on peer review tasks;
- that the learning curve of Facebook's use for learning activities should be analysed because it is a change in the "normal" use of the social tool and it entails new habits;
- that video content sharing could / should be more regular;
- that peers should increase the number and depth of the comments they share on the platform;
- that the teacher should give assignment feedback on Facebook;

- that the social background of each student should be taken into consideration because of the way it influences (costly) internet access at home and on personal MDs.

### **3.4 Direct observation**

All the students already had a private profile, which facilitated the process of inclusion in the Facebook group but, overall, some factors stand out as deserving more reflection and deeper investigation.

The direct observations made during the 16-week semester were recorded on a notebook with comments, allowing us to perceive the general behaviours, highlighting the need for a period of adaptation to the use of Facebook in an educational context, and to further study the learning curve for the adaptation of a social tool in a classroom environment.

An ironic comment made loudly by a student in one of the last face-to-face sessions demonstrates a change in attitudes towards the use of the social network. As it was an exciting experimental class, and in the Computer Room there were 4 students from other classes finishing work assignments, in conversation one of the workshop students told the others: -"Hey guys ... in this class we use Facebook for studying!"

We can sustain that this experience and the associated expectations were positive, but that more research and a greater quantity and diversity of data are necessary to generalize any kind of preliminary results that this work may have originated, and that its greatest virtue has been to outline paths for future research.

## **4. Conclusions and recommendations**

Contributions to understanding the relationship between Facebook and learning are that social media need not be defined as "essential tools" or "advised methodologies" but rather as contemporary human creations whose diverse forms and cultural meanings are strategic for education. In this regard, educational institutions need to adopt these innovative models and bring them into education in order to meet the expectations of new generations of students, who have "grown up digital".

Overall, the attitude of all students in this new experience was very positive and the resulting motivation improved. In this sense, perhaps teachers should combine social media with predetermined learning objectives so that experiences are relevant, taking into account potential distractions when using Facebook and providing relevant guidance.

We acknowledge the limitations of our study, with a small group of students, and indicate as first recommendation the need for more studies, and more diversified research in this area, specifically in the African educational context. Perhaps repeating our process and methodology with other groups of students in future semesters can make the results clearer and more robust.

Finally, in the course of our work, we invited two course directors and three teachers to participate in the Facebook group. This invitation originated in the group and based on the internal resources and models that it makes available for the creation of groups. Unfortunately, the teacher interaction was very limited (it was

used only once by a director and once by a teacher), not significant in the analysis, but certainly suggesting the need for future reflection on teachers' pedagogical positions on the use of social media for teaching and learning activities.

## References

Abeywardena, I. S. (2011) Development of faboodle to Interact on moodle through Facebook. In: *24th ICDE World Conference*, Penang, Malásia.

Bergmann, J. & Sams, A. (2012). *Flip your classroom*. International Society for Technology in Education. p. 19-33.

Bidarra, J. (2010). Emerging digital media, games and simulations: A challenge for open and distance learning. *Revista de Ciências da Computação*, 4, Universidade Aberta.

Bomar, L. (2006). iPods as reading tools. *Principal*, 85(5), 52–53.

Branco, S. (2014). *A rentabilização pedagógica de um grupo fechado no Facebook na disciplina de Inglês*. Relatório de Trabalho de Projeto. Universidade de Lisboa.

Davidovitch, N. & Belichenko M. (2018). Using Facebook in Higher Education: Exploring Effects on Social Climate, Achievements and Satisfaction. *International Journal of Higher Education*. Vol.7, nº1. Retrieved from: <https://doi.org/10.5430/ijhe.v7n1p51>

Dixon, A. (2007). Finding your way: GPS and geocaching. *Learning and Leading with Technology*, 34(8), 29–31.

Flipped Learning Network (FLN). (2014) *The Four Pillars of F-L-I-P*. Acessado em 20(03/2019). Retrieved from: [https://flippedlearning.org/wp-content/uploads/2016/07/FLIP\\_handout\\_FNL\\_Web.pdf](https://flippedlearning.org/wp-content/uploads/2016/07/FLIP_handout_FNL_Web.pdf)

Frazzle, M. (2010). *Digital storytelling guide for educators*. International Society for Technology in Education (ISTE). Retrieved from: <http://www.iste.org/images/excerpts/digsto-excerpt.pdf>

Fogg L., Baird, D. & Fogg, B. (2013). *Facebook para educadores*. Retrieved from: [http://www.totemguard.com/aulatotem/ebook/Facebook\\_para\\_educadores.pdf](http://www.totemguard.com/aulatotem/ebook/Facebook_para_educadores.pdf)

Gámez et al. (2015). *Educational use of Facebook in higher-education environments: current practices and guidelines*. México. Disponível em: <https://www.researchgate.net/publication/279914184>

Gamito, B. (2018). *Uso pedagógico das redes sociais como ferramentas Web 2.0 de auxílio a educação em Moçambique tendências para um ambiente de aprendizagem social e colaborativo para o ensino superior*. Universidade Pedagógica, Maputo.

Gonzalez, M., Gasco, J. & Llopis, J. (2016). *Facebook and Academic Performance: A Positive Outcome*. *Anthropologist*, 23(1,2). pp. 59-67. Retrieved from: <https://www.researchgate.net/publication/297161593>

INTEF. (2017). *Marco Común de Competencia Digital Docente*. EducaLAB. Madrid. Retrieved from: <http://educalab.es/documents/10180/12809/Marco+competencia+digital+docente+2017/afb07987-1ad6-4b2d-bdc8-58e9faeccc>

- Lary, L.M. (2004). A baker's dozen: 13 Palm applications for mathematics (and math related!) instruction. *Learning and Leading with Technology*, 39(9), 22–27.
- Lucas, M. & Moreira, A. (2018). *DigiCompEdu - Quadro Europeu de Competência Digital para Educadores*. Aveiro. UA
- Manca, S. & Ranieri, M. (2013). Is it a tool suitable for learning? A critical review of the literature on Facebook as a technology-enhanced learning environment. *Journal of Computer Assisted Learning*, 29(6), pp. 487–504.
- Mahlmeister, L. & Mattar, J. (2016). *Facebook e ambientes virtuais de aprendizagem: análise da interação na educação à distância*. Pontifícia Universidade Católica de São Paulo - PUC. Relatório de Projeto.
- Moore, M. & Kearsley, G. (2011). *Educação a distância: uma visão integrada*. Tradução de Roberto Galman. São Paulo: Thomson Learning.
- Moura, A. (2010). *Apropriação do telemóvel como ferramenta de mediação em mobile learning: Estudos de caso em contexto educativo* (dissertação de doutoramento). Instituto de Educação, Universidade do Minho.
- Niu, L. (2017). Using Facebook for academic purposes: Current literature and directions for future research. *Journal of Educational Computing Research*. pp. (n/a)
- Oliva, R., Bidarra, J. & Araujo, D. (2017). Video and storytelling in a digital world: interactions and narratives in videoclips, *Comunicação e Sociedade*, vol. 32, 2017, pp. 459 – 476. DOI: [http://dx.doi.org/10.17231/comsoc.32\(2017\).2771](http://dx.doi.org/10.17231/comsoc.32(2017).2771).
- Pachler, N. & Daly, C. (2009). Narrative and learning with Web 2.0 technologies: towards a research agenda. *Journal of Computer Assisted Learning* 25(1), 6-18.
- Patten, K. B. & Craig, D. V. (2007). iPods and English-language learners: A great combination. *Teacher Librarian*, 34(5), 40–44.
- Roschelle, J., Penuel, W. R., Yarnall, L., Shechtman, N. & Tatar, D. (2005). Handheld tools that "informate" assessment of student learning in science: A requirements analysis. *Journal of Computer Assisted Learning*, 21(3), 190–203.
- Royer, R., & Royer, J. (2004). What a concept! Using concept mapping on handheld computers. *Learning and Leading with Technology*, 31(5), 12–16.
- Saxena, A. & Majumdar, P. (2015). *Use of Facebook in Higher Education: An extension of classroom learning*. Amity University, Noida, Índia.
- Shaffer, D. W., Squire, K., Halverson, R. & Gee, J. P. (2005). *Video games and the future of learning* (WCER Working Paper No. 2005-4). Retirado a 20 de janeiro de 2014 de [http://www.wcer.wisc.edu/publications/workingPapers/Working\\_Paper\\_No\\_2005\\_4.pdf](http://www.wcer.wisc.edu/publications/workingPapers/Working_Paper_No_2005_4.pdf)
- Sharples, M. (2000). The design of personal mobile technologies for lifelong learning. *Computers & Education*, 34, 177–193.
- Shoemaker, L. P. (2007). Handhelds for reading and note taking. *Learning and Leading with Technology*, 35(2), 36.



- Siemens, G. (2005). *Connectivism: A learning theory for the digital age*. *International Journal of Instructional Technology and Distance Learning*, 2(1), 1-8.
- Tinker, R., Horwitz, P., Bannasch, S., Staudt, C., & Vincent, T. (2007). Teacher uses of highly mobile technologies: Probes and podcasts. *Educational Technology*, 47(3), 16–21.
- Traxel, J. (2009). Learning in a mobile age. *International Journal of Mobile and Blended Learning*, 1(1), 1-12.
- UNESCO (2008). *ICT competency standards for teachers: implementation guidelines, version 1.0*. Paris.
- Vess, D. L. (2006). History to go: Why iTeach with iPods. *The History Teacher*, 39(4), 479–492.

Despite the variety of new technologies used to maximise the student learning experience, studying at a distance can be a challenge due to the physical separation and lack of interaction between students and lecturers. A lack of student engagement can lead to feelings of isolation, amotivation and less effective learning (Rovai, 2002). Research has suggested that synchronous media can foster a social learning environment and sense of community (SoC).

To address these issues, The Open University, UK implemented interactive web-broadcasts in Science Technology, Engineering & Mathematics (STEM) undergraduate modules. Web-broadcasts allow lecturers an interactive experience with students via live web-streaming, instant messaging and polling widgets during practical science experiments and demonstrations.

The purpose of this research is to investigate the extent to which interactive web-broadcasts influence distance learning students' SoC and support their learning. The project will investigate: 1) the purposes of web broadcasts and strategies lecturers apply to engage with students 2) the ways students use the widgets and instant messaging features to interact and 3) the motivations of students to engage (or not) with the web-broadcasts.

Case-study will evaluate stage 2 practical science modules in Physics and Astronomy and Biology and Health. Data collection will include observation of live and recorded broadcasts, interaction data logs (text-chat and widgets), student questionnaires and student and staff interviews. The intended outcomes will be to compare findings on the effectiveness of the web-broadcasts across disciplines and identify the pedagogic and social features that best support students' engagement while fostering a sense of community at a distance.

#### Reference

Rovai, A. P. (2002). Building Sense of Community at a Distance. *The International Review of Research in Open and Distributed Learning*, 3(1), 1–16. <https://doi.org/10.19173/irrodl.v3i1.79>

## From the Net Generation, to the Netflix Generation: The E-Movie Learning Concept

### DR. MARIKA TAISHOFF

International University of Monaco, MONACO  
mtaishoff@monaco.edu

### DR. PATRICE SARGENTI

International University of Monaco, MONACO  
psargenti@monaco.edu

#### Abstract

The past few years have seen considerable research on two complementary, overlapping and mutually reinforcing trends. One has been the emergence and rapid development of Web 2.0, in particular as regards the Virtual Learning Environment (also known as LMS). Online tools have gradually been integrated into the classroom-teaching environment for a variety of reasons, including teaching effectiveness, cost savings, and student engagement.

The other research track has focused more specifically on the impact that Millennials have had on teaching philosophies and principles. Such studies have underscored the role and importance of active, experiential learning for this group of students where information is presented virtually and visually. Today "reading" and "memorizing" can be seen as being supplanted by "viewing", "gaming", and "applying".

As this article will suggest, the Net Generation should perhaps be redefined as the Netflix Generation. Streaming technologies have created an entirely new viewer experience, of which Netflix is the pre-eminent example.

One global educational institution, the INSEEC Group based in France, taking inspiration from this trend, has invested in creating a new form of teaching methodology called E-Movie learning, based on the principles of a streaming series, complete with professional actors and an engaging storyline. Gaming features, social interaction as well as immediate feedbacks are integral aspects to the series. Entitled "Luxury is You" (Le Luxe, C'est Vous), this e-movie learning approach aims to replace, or complement, a Luxury Services Management course.

The aim of the current research is twofold: firstly, to assess the levels of student engagement and learning outcomes consequent to the inclusion of a specially produced series. A corollary aim is to see the differences, if any, in engagement and outcome when the series is an integral part of an Instructor-led classroom or, rather, a standalone and self-paced study tool.

The results compile three years of operation, analyzing data extracted from the scored packages, and completed by a questionnaire sent to the students.

**Keywords:** online learning, generation Z, student engagement .

## 1. Introduction

The past few years have seen considerable research on two complementary, overlapping and mutually reinforcing trends. One has been the emergence and rapid development of Web 2.0, in particular as regards the Virtual Learning Environment. The plethora of such Web-based platforms—Canvas, Blackboard, etc.—are testament to the gradual yet inevitable integration of online tools into the classroom teaching environment. Much of this research has tried to assess the efficacy and success of these tools across a series of different scenarios and in particular as regards student engagement and learning outcomes. As shall be discussed in this paper, the results are still inconclusive, although a blended approach appears to hold the most promise (Marsh & Drexler, 2001; Means, et.al, 2009). .

The other research track has focused more specifically on the impact that Millennials, also referred to as Generations Y and Z, as well as notably, the "Net" generation (as they have grown up in the digital world, relying on the Internet for entertainment, information, and socialization), have had on teaching philosophies and principles (Deeter-Schmelz,2014). Such studies have underscored the role and importance of active, experiential learning for this group of students.

This has been explained by some researchers as owing to the fact that this population has grown up not only in a digital, online world, but also one in which information is presented virtually and visually, in which "reading" and "memorizing" can be seen as being supplanted by "viewing", "gaming", and "experiencing" (Pelton and True, 2004; Worley, 2011). For educators, the implications of this trend are widespread and significant. The longstanding "sage on a stage" and "chalk and talk" classroom models will need to be rethought if educators are to maintain students' engagement and positive learning outcomes, and a wide variety of interactive, audiovisual, experiential and gaming features will need to be integrated into curricula and pedagogical methodologies (Philipps & Trainor, 20XX)

It goes without saying that both trends –the technological and the generational--will continue to have significant implications on pedagogical methods and approaches. Yet a more recent behavioral trend, especially apparent amongst this same Millennial segment, could soon have an even greater impact. As this article will suggest, the Net Generation should perhaps be redefined as the Netflix Generation. Streaming technologies have created an entirely new viewer experience, of which Netflix is the pre-eminent example, that is already in the process of displacing traditional TV network and cable channel viewing, especially amongst the Millennials and the diverse subsegments of that group. As shall be discussed, there are a variety of reasons for the success of Netflix and similar OTT streaming services amongst this generation. Moreover, the program structure of choice for this segment, in both North America and in Europe, is not the feature length film, but rather the originally produced series.

One global educational institution, the INSEEC Group based in France, taking inspiration from this trend, has invested in creating a new form of teaching methodology based on the principles of a streaming series, complete with professional actors and an engaging storyline. Gaming features, as well as immediate feedback, are also integral aspects to the series. Entitled "Luxury is You" (Le Luxe, C'est Vous), the 11 part series can either be used as a complement to an instructor delivered, classroom course on "Luxury Services Management", or as a self-paced standalone course. In both cases, students need to validate each episode based on a Web-based quiz in order to move on to the next level. At the end, an overall Web-based final validation will be necessary in order to obtain the "Certificate of the Luxury Attitude Academy".

The aim of the current research is twofold: firstly, to assess the levels of student engagement and learning outcomes consequent to the inclusion of a specially produced series, similar in structure and entertainment value to a Netflix type streaming series. A corollary aim is to see the differences, if any, in engagement and outcome when the series is an integral part of an Instructor-led classroom or, rather, a standalone and self-paced study tool.

## **2. Web 2.0 and the Virtual Learning Environment**

The growth of the internet, Web 2.0 technologies and online teaching tools have contributed vastly to encouraging the personalized and individualized learning which, as stated above, is increasingly correlated with positive student learning outcomes.

The "Virtual Learning Environment" is a set of technology tools, such as audio, video, text, animation, and communication (Piccoli, et.al., 2001) which can deliver a more customized and personalized learning experience. Such technology-supported learning tools (such as but not limited to Blackboard, Canvas, and WebCT) are also known as learning management systems, e-learning systems, and online learning systems (Al-Busaidi 2013). The benefits include freeing learners from time and place; provide them with access to an almost infinite array of resources; facilitate collaboration among learners; and give students the ability determine, within limits, the sequence and pacing of their studies (Hill, et.al., 2017).

The rise of Web 2.0 technologies can be seen as facilitating and fostering three new learning approaches which can also be correlated with student engagement and learning outcomes:

- Customization: providing learners with the knowledge they want when they want it and supporting and guiding students individually as they learn.
- Interaction: the ability of computers to give learners immediate feedback, and to actively engage learners in accomplishing tasks.
- Learner control: learners are in charge of their own learning whenever possible, so that they feel ownership and can direct their learning" (Collins & Halverson, 2009)

And yet, despite this potential, the research is still inconclusive when it comes to comparing the results, especially in terms of student engagement and learning outcomes, of the traditional versus online classroom environments. Moreover, Cobo, et.al. (2014) found that 62% of students tend to use learning management systems passively (Hill, et.al., 2017) which in turn diminishes the potential learning outcomes.

The uniform look of the proceedings will help the reader. Note that position and style of headings and subheadings should follow this example.

### **E-Learning: Where We've Been, What We've Learned, Where We're Going**

Although there is apparent consensus on the potential of online options to promote student-driven learning (Arbaugh 2008), despite substantial investments in digitizing education to make information and communication technology an integral part of the overall learning environment, results of current research seem inconclusive concerning the impact of the VLE on students' academic performance (Bertheussen & Myrland, 2016; Ferrer, et.al. 2011; Arbaugh & Benbunan-Fich, 2006).

Some sources have found no valid statistical differences in learning outcomes between face-to-face and online classes (Arbaugh & Benbunan-Fich, 2006; Lyke & Frank, 2012 ). A certain amount of consensus appears to exist however supporting the blended approach as delivering the best pedagogical outcome (Arbaugh, 2014; Callister & Love, 2016; Hill, et. al., 2017).

In short, the question of whether online students learn and retain as much as face-to-face students is yet to be definitively answered. In order to better focus their analysis and findings, some authors have fine-tuned their research according to different variables so as to better assess which learning channel could have the greater success. These approaches look at, notably, whether subject matter content could make a difference and whether the nature of the course—quantitative vs. qualitative—could be the determinant for online vs. face-to-face learning success.

### Subject Matter Dependencies

There has been considerable research examining differences in learning outcomes depending on the subject matter being taught ( Callister & Love, 2016).

Consensus has been hard to come by however. Some studies found no real differences (Weber & Lennon, 2007); others identified marginal differences depending on the level of the students, such as first year university students as opposed to fourth year (Al-Dahir, et.al., 2104) as well as some differences based on the nature of the exam, theoretical versus clinical for instance (Mosalanjad, et.al., 2012) .

### Quantitative Vs. Qualitative Nature of Courses

Several studies (Arbaugh, 2010; Arbaugh, et.al. 2010; Ivancevich, et.al., 2009) have focused on the quantitative vs. qualitative nature of the course as being a possible determinant for student engagement and learning outcomes.

There appears to be some consensus that qualitative courses are more likely to lead to positive online learning results than quantitative subject matters (Arbaugh, 2010; Arbaugh, et.al.,2010; Ivancevich, et.al., 2009).

### The Blended Approach

The most consensus for successful learning results is around the blended approach, sometimes also referred to as the Flipped Classroom. Courses that combine online and face-to-face learning have had higher academic outcomes than either purely online or purely face-to-face instruction (Marsh & Drexler, 2001).

The benefits of the two approaches are different. The benefits of the online experience is that it enables the student to learn at his or her own pace (Al-Busaidi, 2013; Santhanam, et.al., 2008). The benefits of the in-class experience include encouraging interaction, facilitating clarification and providing immediate feedback (Zenger & Uehlein). Feedback in turn is seen as a strong predictor of future academic performance (Hill, et.al., 2017; Swan, 2002), and it has been suggested that feedback, if properly designed into the pedagogical approach, may provide the impetus for use of the online component of blended learning. (Daspit and D'Souza 2012; Hill et.al., 2017; Tsai 2013)

### Importance of Feedback and Learner Control in Learning Outcomes in the VLE

Other research has shown that the provision of performance feedback strongly predicts future effort, and thereby future performance. Research has shown that when motivated learners are provided rapid appraisals

of their performance, they adjust future behaviours accordingly, either by looking for ways to improve their performance or continuing their patterns of behaviour. In fact, some research shows that students who received feedback on self-regulated learning in an online course had substantially higher learning outcomes than those who did not receive feedback (Hill, et.al 2017; Tsai, 2013).

Learner control was also correlated to the extent that the online learning system was actively used (Hill, et.al., 2007; Piccoli, et.al., 2001).

The importance of active learning in the online environment appears important to overall outcomes:

“Active course designs are based on the assumption that an active learner, or one who is involved in the learning process, learns much more effectively and the learning experience is more intense and permanent than for passive learners enrolled in a traditional lecture style class.” (Wingfield, et.al., 2005). Experiential learning is rooted in active course design. Experiential learning theory is based on more than theory, and instead suggests that learning is an active process (Kolb, 2005). Other research has shown that experience based learning—which can refer to “curriculum-based face-to-face interactions...[such as] faculty-directed internships, practica, directed applied research, travel study, etc. “, in contrast to the readings and lecture format of lecture-based education, had significant cognitive benefits (Wright, 2007).

Researchers have also found that the Net Generation—today’s students— have a marked preference for experiential, hands-on learning, due in large part to having grown up “digital”. (Oblinger, 2005).

### **The Visual and Virtual Generation of Students**

Faculty everywhere today are confronting a new kind of university cohort: the so-called Generation Y and Generation Z members, with Generation Y typically born between 1997 and 1994 (Deeter-Schmelz; Weiss 2003) and Z born between 1995 and 2009 (Williams, 2010). These two populations are frequently referred to together as Millennials.

Several common characteristics have been identified across these groups: an attachment to technology, including acquiring the latest tech gadget (Oblinger, 2003; Worley, 2011); an ease with using computers and technology (Jones, 2012); and significant abilities to multi-task. (Williams, 2010). Perhaps as a corollary to the multitasking ability is short attention span, and a deterioration in reading skills or aptitudes. (Jones, 2012)

Such students prefer using technology to gather content, with action and results more important to them than the accrual of facts ( Oblinger, 2003); they prefer visual learning and seeing concepts as opposed to reading about them (Black, 2010); they like to have more control over how messages and information are received (Williams, 2010); and they prefer being entertained when gathering information (Morton, 2003).

As a result, faculty need to find ways to incorporate “new technologies, new modes of communication, and engagement and interaction into the learning environment” (Worley (2011).

### The Role of Videos in Student Engagement

The notion of student engagement has been defined and measured in different ways over the past few decades (Burch, et.al, 2015; Dixon, 2015). Trowler’s (2010) definition for student engagement is “the time and effort students devote to activities that are empirically linked to desired outcomes of college and what institutions



do to induce students to participate in these activities". Three dimensions have been associated with student engagement:

- Behavioural engagement: a student's ability to abide by behavioural norms, which include attendance, attention and effort (Trowler, 2010).
- Emotional engagement: the extent to which a student experiences affective reactions, which can include interest, enjoyment or a sense of comfort towards educators or extracurricular activities (Wolters & Taylor, 2012).
- Cognitive engagement: a student's competency and willingness to learn and establish goals (Archambault, et.al, 2009).

Several studies have found a correlation between student engagement, and student learning outcomes (Carini, et al., 2006; Kuh, 2003; 2013; McCormick, et.al., 2013; Pascarella & Terenzini, 2005). The online environment has furthermore been found to have significant potential to actively engage with students (Robinson et al., 2008).

As digital technology has evolved, concomitant with the development of fast access streaming channels, video has become an important part of many courses as it seems to be a more effective teaching channel than methodologies based on books or text material, since online videos encourage active learning approaches that in turn enable easier assimilation of information. The results of one particular study—focusing on the classroom and extracurricular usage of Khan Academy films—suggested that students in the flipped courses using the videos scored between 4 and 14 percentage points higher on a set of common questions and a cumulative final exam. (Caviglia-Harris, 2016).

Interactive classrooms where video is an integral pedagogical element have been shown to improve student understanding of concepts, maintain engagement, and create interest in the field (Durham, et.al, 2007; Carter and Emerson 2012). The online videos have been shown to serve as additional review tools, as well as a "virtual on-demand tutor" for students, enhancing classroom discussion, problem solving, and critical thinking (Forsey et.al, 2013; Green, 2015).

Part of the benefit of the online learning experience is that it allows for autonomous learning. According to Peters (1998) It has been shown that autonomous learning not only allows students to take initiative and plan their individual learning journeys: they are forced to do so. Deciding where, when, how long and how fast to study obliges students to become responsible for their learning. In the process they also become more active learners (Peters, 1998).

Other research has shown that not only do educationally intended videos, such as those on Khan Academy, have an impact on engagement and learning outcomes. So too can the use of videos such as those widely available on YouTube also be applied in classroom settings to enhance engagement and outcomes (Clark and Stewart, 2007; Roodt, 2013). Some researchers have focused on the learning impact of students themselves actively engaged in finding media clips to support the themes addressed and general class discussion (Donovan-Poulenez, 2016).. The results showed that student selected media clips led to improved student awareness and understanding of course concepts. According to Scherer and Baker (1999), film content has also been shown to provide a familiar attention-capturing and visual way to engage students.

This is perhaps not surprising, given that undergraduate students today have grown up as watchers, not readers (Donovan-Poulenez, 2016). Already in 1986, researchers called their students the "TV Generation". It was shown that student learning, interest and motivation could be enhanced through the use of TV shows, films, and other clips (Addams, et.al, 2013; Donovan-Poulenez, 2016; Taylor & Provitera, 2011).

About 20 years later, researchers observed the evolution of students into the virtual realm as well: they were not just visual, but also virtual (Proserpio & Gioia, 2007).

Other researchers called this the Net Generation, referring to a homogenous group who have grown up with and are immersed in technology (Kennedy, et.al, 2010). They are characterized as operating at "twitch speed", responding to and expecting feedback almost instantaneously (Duffy, 2007). They also prefer gathering information through pictures and videos over text (Helsper & Eynon, 2010).

As they are tech-savvy, students from the Net Generation embrace different learning approaches (Bennett & Maton, 2010). It is for this reason that technological tools within the classroom are becoming mandatory if Net generation students are to be engaged (Abell, 2011). The use of YouTube in the classroom for instance has been posited as an innovative teaching method (Roodt , 2013) since these tools enrich course content and thus improve student engagement (Caviglia-Harris, 2016; Roodt, 2009).

Research shows that the Net Generation wants to learn differently (Roodt et al., 2009). Other characteristics noted about this generation and which could have an impact on higher education include:

- Being connected – They are almost always online
- Experiential – They have an exploratory style of learning with a preference for 'learning by doing'
- Social - They seek to interact with others in their personal lives, their online presence, or in class, hence the success of social networks
- Engagement and Experience – They like interactivity, for example: watching a YouTube ® video on a topic instead of reading slides.
- Visual and Kinaesthetic – They are more comfortable in image-rich environments than with text (Oblinger, 2003; Oblinger & Oblinger, 2005 )

### **Adding Games to Videos**

Gamification can be described as the use of game elements such as rewards and achievement levels in situations which are not games in and of themselves, but rather serve an educational purpose. It has been shown that the use of leader boards, badges and rewards are ways to encourage students to engage more actively in the VLE. There is apparent consensus that one key advantage of educational games is that the overall learning experience becomes more motivating and appealing (Bryant, 2018; Rieber et al., 1999). The reason behind this finding is that games encourage drive, engagement and fun (Annetta,2008; Roberts, et.al, 2005)

Gaming as a corollary in successful teaching has been researched for several years (Juul, 2005; Klopfer, et.al, 2009; Young et al., 2012). Until recently, most of findings focused on student learning outcomes. More recent research has focused on the correlation between gaming and student satisfaction and engagement (Boyd, 2016; Connolly, Boyle, MacArthur, & Boyle, 2012).

Researchers have shown how game playing in general can lead to better student engagement (Auman, 2011; Davis, 2011) as well as to enhance active and collaborative learning (Auman, 2011; Boyd, 2016; Moizer, et.al, 2009). Other studies suggest that online learning can be enhanced with the inclusion of gaming (Varney 2016).

### **The Streaming Series and the Millennial/Net Generation**

A technological development which is having a huge impact on traditional telecom providers, in particular television and cable, has been video streaming. A variety of research firms have studied these trends, both in the US and abroad, and have come up with similar conclusions as to the preponderance of over-the-top (OTT) video streaming service providers, in particular Netflix.

In the US, more homes have access to streaming services than to cable TV: 61% of total homes had cable, while 67% had access to or watched any streaming service. Homes with millennial occupants had access to far more streaming services, and a majority with such generations at home had either cut their cable subscriptions, or had no cable whatsoever. And among the numerous OTT streaming service providers, Netflix was the most popular by a wide margin. (Baumgartner, 2017).

Another study showed that 85% of millennials in the US subscribe to at least one OTT video service—Netflix—and that 25% of those subscribe to three or more such services (Multichannel News, 2 July 2018).

Given such findings it is no wonder that streaming has become the new normal for millennials (Horwitz, 2016). Amongst millennials, 54% of TV viewing time is spent streaming, with just 25% live. This is in contrast to the population at large, where 50% of viewing is live, and 29% streamed. The same report showed that whereas amongst millennials the weekly share of streamed viewing rose from 15% in 2012, to 54% in 2016, traditional viewing has dropped from 75% to 39%. And, also in this study, Netflix has been identified as the "go-to" source for TV amongst this generation (Horwitz, 2016).

Focusing specifically on Generation Z, a study shows that a real synergy exists between Netflix in particular, and the seven-to-22 years old who comprise Generation Z. A survey of nearly 8500 Gen Z-ers demonstrated that Netflix was their fourth favorite overall brand in the world, whereas no conventional and popular American TV network such as MTV, Nickelodeon, or Comedy Central, even made the top 100 brands. A study by Business Insider suggested that 62% of Gen Zs used an online streaming service, primarily Netflix, as their primary video source. One of the reasons, according to researchers, was that this particular demographic generation was "driven by a need to be *in the know*" about the various series in order to be able to participate in the social conversation (Berman, 2019).

The same trend for streaming services, and in particular Netflix, is not limited to American millennials. In France, 11% of millennials view streaming services, such as Netflix and Amazon Prime, on a daily basis; only 4% of the older population does so. Typically, these millennials watch video on demand on one of the OTT streaming services an average of one hour and 48 minutes a day, with the series being the major chunk of that time, at one hour and three minutes a day—the length of a typical series. (Bonacossa, 2018). An interesting finding is that watching videos on line on YouTube, Facebook and Twitter represents only four minutes a day amongst millennials (Bonacossa, 2018).

### **3. Our research**

#### **The e-movie learning concept**

In that context, in 2015 INSEEC-U Group with one of their brands, Luxury Attitude, decided to adapt and innovated by creating a new concept called "e-movie learning". The e-movie learning concept includes on demand series streaming, social sharing, gamification and traditional assessment.

The starting point is a TV series, made up of short episodes (20 mins max); this series is professionally produced with a real scenario, a real story and real actors. The scenario has been built in such a way that each episode

includes a learning objectives, along with one or several learning goals defined by the academic team. The platform complemented each episode with additional videos, including interviews of CEOs of leading global companies, as well as scormed packages containing academic content. Once they have watched all the videos of a given episode, students are requested to answer specific questions as well as to upload on the platform their own observations from personal experience about the topics covered in the episode. This portfolio of information can be shared with the course leader and the wider "Luxury Attitude" community. Gamification plays an important role here, since each time the shared portfolio is liked by other member of the community (the class, the active learner, all the community) it grants additional points to the "liked" student.

Moreover, after every four episodes a compulsory quiz has to be done on the platform; this quiz can be repeated as many times as needed to achieve the required minimum score of 80 out of 100. Once this score is reached the next episode becomes available, and an algorithm grants a certain number of points to the student according to the number of attempts and the results reached. Each quiz can be run at home or in class, it depends if the course is delivered in a blended format or completely asynchronously.

There is a final assessment as well, the final Quiz, assessing and summarizing all the concepts covered since the beginning. Once this quiz has been passed, the last bonus episode (12<sup>th</sup>) is unlocked.

### **MEASURES OF E-MOVIE LEARNING**

We ran the course over the last three years using different formats of delivering: completely asynchronous; asynchronous but with the quizzes in class; or blended with additional in class teaching sessions with a professor complementing and invigilating the evaluations in class.

The purpose of the diverse delivery methods was to assess the differences if any in performance and engagement.

We tried to measure engagement following the three dimensions described previously: Behavioural, Emotional and Cognitive engagement.

Measure of the Behavioural engagement: Behavioural engagement defines a student's ability to abide by behavioural norms, which include attendance, attention and effort (Trowler, 2010). The online platform used is based on the Moodle system, allowing the collection and analysis of various quantitative measures such as: total number of connections; average number of connections per week; time spent on the platform per week per episodes; and, finally, respect of the deadlines (episode to be completed, or quiz to be passed, etc...). These logs seemed relevant as a measure of Behavioural engagement. Other information retrieved, like time of connection, could provide additional qualitative insight on student behavioural engagement.

Measure of Emotional engagement: Emotional engagement defines the extent to which a student experiences affective reactions, which can include interest, enjoyment or a sense of comfort towards educators or extracurricular activities (Wolters & Taylor, 2012). The measure of this emotional engagement could be performed based on the qualitative analysis of the personal portfolio written by each learner (quantity, quality), and his or her ranking along the parameters of being liked, and liking others.

Measure of Cognitive engagement: Cognitive engagement defines a student's competency and willingness to learn and establish goals (Archambault, Janosz, Fallu, & Pagani, 2009). This measure could be performed thanks to other metrics like quiz results, or the number of attempts before reaching the required 80 out of 100 grade on each quiz. More interestingly, we could compare the results of quiz results when done in class, or remotely.

## MEASURES AND FINDINGS

A lot of different measures and analysis have been performed, some of them aren't really meaningful, for example some students were allowed to use the platform in French and others in English, therefore some elements of the analysis have yet to be performed while awaiting translation. Notwithstanding this, the data has provided some very interesting insights, as described below.

Behavioral engagement measures could be extracted from log analysis. The logs retrieval process was not 100% perfect since the platform changed once in the period, so we could only use a certain amount of the data. Nevertheless, the data showed an average number of connections above 50 per student, with more than 5 connections per episode, and an average time spent on the platform of 21 hours per student. The average time spent per episode on the platform is reaching 2 hours. Knowing that the movie series is only 20 minutes, this reveals that the student watches the episode several time, in order to create his or her portfolio of observations as well as reply successfully to the questions.

Meeting deadlines is another measure that could be explored to describe behavioral engagement. In the last three years of operations, I asked my students to take the intermediary quiz online during a particular evening before midnight. There is one quiz per every four episodes, for a total of three intermediary quizzes. The students were allowed to meet to do it, they were allowed to exchange ideas while at a Starbucks café for example and reflect in groups during this particular evening. However, each student had to individually complete each quiz using their own login name. In the last three years, less than 1% of the students missed these deadlines. This percentage is much less than a typical quiz administered in class, and is thus a telling measure of Behavioral engagement.

An interesting proposal to measure of Emotional engagement could be the analysis of the student portfolio posts shared amongst one another. Each episode includes additional questions linking personal behavior and topics covered during the chapter. The portfolio posts can be shared to the community, the members of whom interact, by commenting and/or liking student posts, through a private social network. On average each post shared with the community exceed 50 words, whereas the posts answered, but not shared, are clearly smaller, at less than 20 words. The pattern that could be defined is that behavioral engagement is positively impacted by this sharing system, with qualitative comments coming from the community along with likes operating almost as a collective grading system.

Finally, the results of the various quizzes and the final assessment could be used as a measure of cognitive engagement.

Table 1: Average performance on the 4 assessments for the last 3 groups of students.

	Quiz Average
Validation 1 (home)	89.07216495
Validation 2 (home)	89.39515464
Validation 3 (home)	88.5326087
Final Validation in class	89.04761905

Table 1: average performance on the 4 assessments for the last 3 groups of students.

Interestingly there is no significant performance difference between the first 3 quizzes done remotely in the evening, even potentially working together collaboratively, and the final individual validation performed in class. This measure leads to the reflection that a student's competency and willingness to learn, as measured

by the quiz results, shows that the e-movie learning model positively affects cognitive engagement since in class assessment is even better than in the previous quizzes.

#### **4. Limitations & further studies**

The limitation of this study is clearly the reliability of data collected through the platform's logs. We succeeded in extracting a significant amount of data, but could not exploit more than half of it. Moreover it is obvious now that some data seems to be more relevant than others to measure student engagement, and that some of them do not yet exist (such as number of likes, number of shares, number of comments..). The collection of additional data needs to be implemented on the platform in order to more precisely refine these measures.

Lack of benchmark: the Moodle platform is used for all courses at IUM, whether they are online, blended, or in class. While an enormous amount of logs are available, the retrieval of such data to benchmark our current measures is still in process. The next step of this study will be to extract data from other IUM courses in order to be able to compare them with the data retrieved from the e-movie learning platform.

Multilanguage problem: the platform is available in French and in English, therefore the Qualitative data (portfolios, comments etc..) are split into both languages. An automatic translation process has to be implemented in the platform to collect homogenous data before beginning to analyse it.

The e-movie learning Luxury Attitude is proposed to professional (executive education) audience as well, but for confidentiality reasons this data wasn't accessible. An interesting additional study could be to compare Gen Z students engagement and performance data with executive (Gen X & Y) in the context of this e-movie learning platform.

#### **5. Conclusions**

This paper's main purpose was to try to understand if and how student engagement can be measured in the context of an online class. For that, the Luxury Attitude e-movie learning module in the framework of the e-movie learning platform developed by INSEEC-U Group, has been used. An attempt at behavioral, emotional and cognitive engagement measures was performed, through logs and performance analyses, using both qualitative and quantitative data.

The findings of this study clearly show that a measure is possible for behavioral, emotional and cognitive engagement. The most interesting results may be that GenZ students, through their journey in e-movie learning, seem to learn quite naturally thanks the platform's ability to provide on demand learning, collaborative learning and data sharing. The final evaluation assessment in class showed a very high performance rate, equivalent to the assessment operated asynchronously. Moreover, it has been seen that feedback from the community through social network comments, complements the professors' feedback to students, and that the "Likes" from the community can have a better impact than grades in term of engagement.

All these observations not only showed us that a measure of student engagement is possible, but also that adapting courses and teaching methodologies to the Netflix Generation have a positive impact on student engagement and thus on learning outcomes.

## REFERENCES

- Al-Busaidi, K. A. (2013). An Empirical Investigation Linking Learners' Adoption of Blended Learning to Their Intention of Full E-learning. *Behaviour & Information Technology* 32 (11): 1168–1176.
- Adams, L., Fan, Y, & Morgan, J. (2013). Teaching Management Principles by Integrating Video Clips to Enhance Learning. *Business Education Innovation Journal*, 5(2):58-67.
- Alavi, M., and D. E. Leidner. (2001). Research Commentary: Technology-Mediated Learning – A Call for Greater Depth and Breadth of Research. *Information Systems Research* 12 (1): 1–10.
- Alavi, M., G. M. Marakas, and Y. Yoo. (2002). A Comparative Study of Distributed Learning Environments on Learning Outcomes. *Information Systems Research* 13 (4): 404–415.
- Al-Dahir, S., Bryant, K., Kennedy, K. B., & Robinson, D. S. (2014). Online virtual-patient cases versus traditional problem-based learning in advanced pharmacy practice exercises. *American Journal of Pharmaceutical Education*, 78(4), 1–9.
- Annetta, L. (2008). Video Games in Education: Why They Should Be Used and How They Are Being Used. *Theory Into Practice*, 47:229–239
- Arbaugh, J. B. (2008). Introduction: Blended Learning: Research and Practice. *Academy of Management Learning & Education* 7 (1): 130–131.
- Arbaugh, J. B. (2014). "What Might Online Delivery Teach Us about Blended Management Education? Prior Perspectives and Future Directions. *Journal of Management Education* 38
- Arbaugh, J., and R. Benbunan-Finch. (2006). An Investigation of Epistemological and Social Dimensions of Teaching in Online Learning Environments. *Academy of Management Learning & Education* 5 (4): 435–447.
- Archambault, I., Janosz, M., Fallu, J. S., & Pagani, L. S. (2009). Student engagement and its relationship with early high school dropout. *Journal of Adolescence*, 32(3), 651-670.
- Armstrong, S. J., and E. Sadler-Smith. (2008). Learning on Demand, at Your Own Pace, in Rapid Bite-Sized Chunks: The Future Shape of Management Development? *Academy of Management Learning & Education* 7 (4): 571–586.
- Auman, C. (2011). Using simulation games to increase student and instructor engagement. *College Teaching*, 59(4), 154–161.
- Baumgartner, J. (2018). *Multichannel News*. 2 July.
- Bennett, S., & Maton, K. (2010). Beyond the 'digital natives' debate: Towards a more nuanced understanding of students' technology experiences. *Journal of Computer Assisted Learning*, 26(5)
- Berman, J. (2019). Netflix's Latest Numbers Show It Has One Demographic in Mind. *Time.com*, 1 26
- Bertheussen, B. and Myrland, O. (2016). Relation between academic performance and students' engagement in digital learning activities. *Journal of Education for Business*, Vol. 91, No. 3, 125–131
- Black, A. (2010). Gen Y: Who They Are and How They Learn. *Educational Horizons*. V. 88, No. 2
- Bonacossa, J. (2018). Les millennials férus de SVOD. *Strategies* no. 1965. 11 October
- Boyd, S. (2016). Experiencing university through playing property. *Pacific Rim Property Research Journal*, 22(1)
- Bryant, L. (2018). How gameplay can enhance learning and engagement for First year property students: a case study using Monopoly City™. *Pacific Rim Property Research Journal*, Vol. 24
- Burch, G., Heller, N., Burch, J., Freed, R., and Steed, S. (2015). Student Engagement: Developing a Conceptual Framework and Survey Instrument. *Journal of Education for Business*, 90: 224-229.



- Callister, R. R., and M. S. Love. (2016). A Comparison of Learning Outcomes in Skills-Based Courses: Online Versus Face-to-Face Formats. *Decision Sciences Journal of Innovative Education* 14 (2)
- Carini, R. M., Kuh, G. D., & Klein, S. P. (2006). Student engagement and student learning: Testing the linkages. *Research in Higher Education*, 47
- Carter, L. K., and T. L. N. Emerson. 2012. In-class vs. online experiments: Is there a difference? *Journal of Economic Education* 43(1):4–18.
- Caussat, P. 2018. L'info où je veux, quand je veux. *Strategies* no. 1972. 29 November.
- Caviglia-Harris, J. (2016). Flipping the Undergraduate Economics Classroom: Using Online Videos to Enhance Teaching and Learning. *Southern Economic Journal* 83 (1) 321-331
- Clark, T. and Stewart, J. (2007). Promoting Academic Programs Using Online Videos. *Business Communication Quarterly*, Vol. 70, No. 4, pp. 478-482.
- Cobo, A., R. Rocha, and C. Rodríguez-Hoyos. (2014). Evaluation of the Interactivity of Students in Virtual Learning Environments Using a Multicriteria Approach and Data Mining. *Behaviour & Information Technology* 33 (10): 1000–1012.
- Collins, A., Halverson, R. (2009). *Rethinking Education in the Age of Technology*. New York,
- Connolly, T., Boyle, E., MacArthur, T., & Boyle, J. (2012). A systematic literature review of empirical evidence on computer games and serious games. *Computers & Education*, 59, 661–686.
- Daspit, J., and D. D'Souza. (2012). Using the Community of Inquiry Framework to Introduce Wiki Environments in Blended Learning Pedagogies: Evidence from a Business Capstone Course. *Academy of Management Learning & Education* 11 (4): 666–683.
- Deeter-Schmelz, D. (2014). Shark Attack! Using an Online Tool to Enhance Student Learning. *Business Education Journal* vol. 6, no. 2
- Dixon, M. (2015). Measuring Student Engagement in the Online Course. *Online Learning*, vol. 19, 4
- Donovan-Poulenez, C. (2016). Using Media Clips with the Visual/Virtual Generation: We are Doing it Backwards. *Business Education Innovation Journal* Volume 8 Number 2
- Duffy, P. (2007). Engaging the YouTube google-eyed generation: Strategies for using web 2.0 in teaching and learning. *European Conference on ELearning, ECEL*, 173-182.
- Durham, Y., T. McKinnon, and C. Schulman. 2007. Classroom experiments: Not just fun and games. *Economic Inquiry* 45(1):162–178.
- Forsey, M., M. Low, and D. Glance. 2013. Flipping the sociology classroom: Towards a practice of online pedagogy. *Journal of Sociology* 49(4):471–485
- Green, T. (2015) Flipped Classrooms: An Agenda for Innovative Marketing Education in the Digital Era. *Marketing Education Review*, vol. 25, no. 3
- Helsper, E. J., & Eynon, R. (2010). Digital natives: Where is the evidence? *British Educational Research Journal*, 36(3), 503- 520.
- Hill, T., Chidambaram, L., and Summers, J. (2017). Playing 'catch up' with blended learning: performance impacts of augmenting classroom instruction with online learning. *Behaviour & Information Technology*, Vol.. 36, No. 1, 54–62
- Horwitz Report: *State of Cable and Digital Media*, May 2016
- Ivancevich, J. M., Gilbert, J. A., & Konopaske, R. (2009). Studying and facilitating dialogue in select online management courses. *Journal of Management Education*, 33, 196–218.
- Juul, J. (2005). *Half real: Video games between real rules and fictional worlds*. Cambridge: MIT Press.
- Kennedy, G., Judd, T., Dalgarno, B., & Waycott, J. (2010). Beyond natives and immigrants: Exploring types of net generation students. *Journal of Computer Assisted Learning*, 26(5), 332-343.

- Klopfer, E., Osterweil, S., & Salen, K. (2009). *Moving learning games forward*. Cambridge, MA: Education Arcade.
- Kolb, A. Y. & Kolb, D. A. (2005). Learning styles and learning spaces: Enhancing experiential learning in higher education. *Academy of Management Learning and Education*, 4, 193–212.
- Kuh, G. (2001). Assessing what really matters to student learning inside the National Survey of Student Engagement. *Change: The Magazine of Higher Education*, 33(3), 10-17.
- Kuh, G. D., Cruce, T. M., Shoup, R., Kinzie, J., & Gonyea, R. M. (2008). Unmasking the effects of student engagement on college grades and persistence." *Journal of Higher Education*, 79, 540-563.
- Lyke, J. & Frank, M. (2012). Comparison of student learning outcomes in online and traditional classroom environments in a psychology course. *Journal of Instructional Psychology*, 39(4), 245–250.
- McCormick, A. C., Kinzie, J., & Gonyea, R. M. (2013). Student engagement: Bridging research and practice to improve the quality of undergraduate education. In M. B. Paulsen (Ed.), *Higher education: Handbook of theory and research*, 28 (pp. 47-92). Dordrecht, The Netherlands: Springer.
- Marsh, J., and P. Drexler. 2001. *How to Design Effective Blended Learning*. Sunnyvale, CA: Brandon-Hall.
- Means, B., Toyama, Y., Murphy, R., Bakia, M., & Jones, K. (2010). Evaluation of evidence-based practices in online learning: A meta-analysis and review of online learning studies. Washington, D.C.: *U.S. Department of Education, Office of Planning, Evaluation, and Policy Development*.
- Moizer, J., Lean, J., Towler, M., & Abbey, C. (2009). Simulation and games: Overcoming the barriers to their use in higher education. *Active Learning in Higher Education*, 10(3), 207–224.
- Morton, L.P. (2002). Targeting Generation Y. *Public Relations Quarterly*, V. 47, No. 2, pp. 46-49.
- Mosalanejad, L., Shahsavari, S., Sobhnia, S., & Dastpak, M. (2012). The effect of virtual versus traditional learning in achieving competency-based skills. *Turkish Online Journal of Distance Education*, 13(2), 69–75.
- Oblinger, D. (2003). Boomers, Gen-Xers and Millennials: Understanding the new students.. *Educause Review*, July/August 2003.
- Oblinger, D., & Oblinger, J. (2005). *Educating the Net Generation*. Boulder: EDUCAUSE.
- Pascarella, E., & Terenzini, P. (2005). *How college affects students: A third decade of research* (Vol. 2). San Francisco: Jossey-Bass.
- Pelton, L.E. and True, S.L. (2004). Teaching Business Ethics: Why Gen Y? *Marketing Education Review*. V. 14, No. 3, pp. 63-70.
- Peters, O. (1998). *Learning and Teaching in Distance Education*. London: Kogan Page Limited.
- Phillips, C., and Trainor, J. (2014). "Millennial Students and the Flipped Classroom."
- Piccoli, G., R. Ahmad, and B. Ives. (2001). "Web-Based Virtual Learning Environments: A Research Framework and a Preliminary Assessment of Effectiveness in Basic IT Skills Training." *MIS Quarterly* 25 (4): 401–426.
- Proserpio, L., and D. A. Gioia. 2007). Teaching the Virtual Generation. *Academy of Management Learning & Education* 6 (1): 69–80.
- Rieber, L. P., Smith, L., & Noah, D. (1998). The value of serious play. *Educational Technology*, 38(6), 29– 37.
- Roberts, D. F., Foehr, U. G., & Rideout, V. (2005). *Generation M: Media in the lives of 8–18-year-olds*: Menlo Park, CA: Kaiser Family Foundation.
- Robinson, C. C., & Hullinger, H. (2008). New benchmarks in higher education: Student engagement in online learning. *Journal of Education for Business*, 84(2), 101–109.
- Roodt, S. (2013). Using YouTube to Support Student Engagement for the Net Generation in Higher Education. Paper presented at the Proceedings of the 4th International Conference on IS Management and Evaluation: ICIME 2013, Vietnam.

- Roodt, S., & De Villiers, C. (2011). Using YouTube as an Innovative Tool for Collaborative Learning at Undergraduate Level in Tertiary Education. Proceedings of the AIS SIG-ED IAIME 2011 Conference.
- Santhanam, R., S. Sasidharan, and J. Webster. 2008. "Using Self-regulatory Learning to Enhance E-learning-Based Information Technology Training." *Information Systems Research* 19 (1): 26–47.
- Scherer, R. F., & Baker, B. (1999). Exploring social institutions through the films of Frederick Wiseman. *Journal of Management Education*, 23, 143-153.
- Swan, K. 2002. "Building Learning Communities in Online Courses: The Importance of Interaction." *Education*, 58 (11): 52–55
- Swan, K., Shea, P., Fredericksen, E., Pickett, A., Pelz, W., & Maher, G. (2000). Building knowledge building communities: Consistency, contact and communication in the virtual classroom. *Journal of Educational Computing Research*, 23(4), 359–383.
- Taylor, V.F. & Provitera, M.J. (2011). Teaching labor relations with Norma Rae. *Journal of Management Education*, 35,749-766.
- Trowler, V. and Trowler, P. (2010) Student engagement literature review. Available from:  
[www.heacademy.ac.uk/resources/detail/ourwork/studentengagement/Research\\_and\\_evidence\\_base\\_for\\_student\\_engagement](http://www.heacademy.ac.uk/resources/detail/ourwork/studentengagement/Research_and_evidence_base_for_student_engagement).
- Tsai, C.-W., P. Shen, and M. Tsai. 2013. "Developing an Appropriate Design of Blended Learning with Web- Enabled Self-regulated Learning to Enhance Students' Learning and Thoughts Regarding Online Learning." *Behaviour & Information Technology* 30 (2): 261–271.
- Varney, J. 2016. "Games, Bots and Videos-The Changing Face of E-learning." *Human Resources*, Winter.
- Weiss, M.J. (2003). To Be About To Be. *American Demographics*. V. 25, No. 7, pp. 28-36.
- Williams, S. (2010). Welcome to Generation Z. *B+TMagazine*. V. 60, No. 2731, p. 12.
- Wingfield, S., et.al. (2005) "Active vs. Passive Course Design: The Impact on Student Outcomes." *Journal of Education for Business*, November/December
- Wright, E. R. & Lawson, A. H. (2007). Computer Mediated Communication and Student Learning in Large Introductory Sociology Classes. *Teaching Sociology*, 33(2), 122-135.
- Wolters, C. A. & Taylor, D. J. (2012). A Self-Regulated Learning Perspective on Student Engagement. in *Handbook of Research on Student Engagement* (635- 651)
- Worley, K. (2011). Educating College Students of the Net Generation. *Adult Learning*. V. 22, No. 3, pp. 31-39.
- Young, M., Slota, S., Cutter, A., Jalette, G., Mullin, G., Lai, B., .Yukhymenko, M. (2012). Our princess is in another castle: A review of trends in serious gaming for education. *Review of Educational Research*, 82, 61–89.
- Zenger, J., and C. Uehlein. 2001. "Why Blended Will Win." *T+ D* 55 (8): 54–62

## Gamification Didactics in Massive Learning Designs

Tiberio Feliz-Murias

UNED, Spain

tfeliz@edu.uned.es

David Recio Moreno

UNED, Spain

davidrecio@bec.uned.es

### Abstract

Gamification is a trending topic in education nowadays. Authors and researchers have studied it from several points of view. Some assert a narrow vision and others from a larger point of view that seems to be more practical. It could be considered as a structure or content, as a method or as a technique, and based on learners, teachers, or means. Several gamification tools and resources are explained: Kahoot!, AnswerGarden, Classkick, EdPuzzle, GoSoapBox, Twitter, Google Hangouts, and Instagram.

### 1. Introduction

The swiss researcher Jean Piaget said that playing is an activity that has a goal in itself. This was based on his studies on the younger babies, from birth to two years-old (Beilin, 1992). This life step is really linked to the gamification concept, since we use any kind of activity or behaviour to feel playfully or enjoy. By moving, expressing, or perceiving, we enjoy. No goals, no rules, no adversaries are needed. Pleasure by itself.

Gamification is already present in any field. "Gamification is used as the experiential learning technique, and even beyond, to encourage the engagement with the product or a service or a brand. Gamification can be seen in almost each field now, from education to business to life coaching to apps and more. It has to power to enhance a user experience by immersing the users with a gamified system that both engages and stimulates them." (Goethe, 2019, p. 13)

Several authors have studied gamification from several points of view. These different approaches could be interesting as a theoretical framework; however, teachers would be interested on a practical use of these theories and models. We are beginning by a classical definition:

"'Gamification' refers to the use (rather than the extension) of design (rather than game-based technology or other game-related practices) elements (rather than full-fledged games) characteristic for games (rather than play or playfulness) in non-game contexts (regardless of specific usage intentions, contexts, or media of implementation)." (Deterding et al., 2011, p. 13)

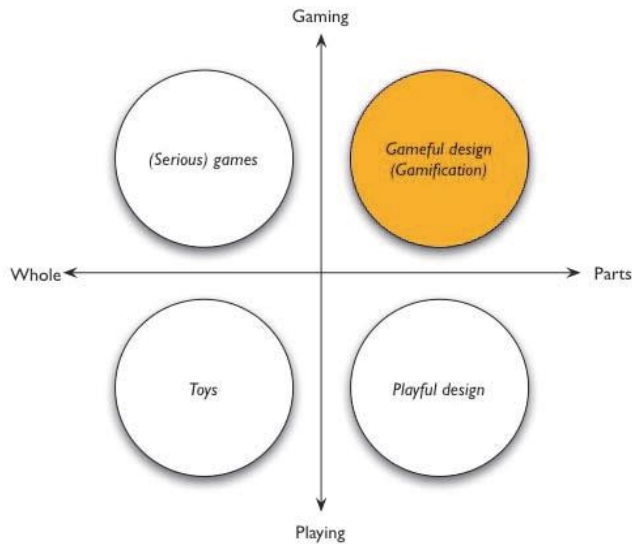


Figure 1: Gamification in context (Deterding et al., 2011, p. 13)

That means that they prioritize gameful design as a part of the course design rather than a whole approach or playing technique (Figure n. 1). In practice, we do not avoid any opportunity. Playful designs, toys, or games are also welcome. In fact, an integrative approach will be more useful, functional, and applicable. Let's analyse features and options to go in depth in gaming opportunities for learning.

According to Kapp (2012), Gamification can be structure or content based. Structural components refer to procedures or process ways to carry out the learning; gamification contents refer to ideas, concepts, or words that contribute to relax tensions or to insert some kind of playful sense.

From a curricular point of view, gamification could be considered as a method or a technique (IRMA, 2016). As a method, it would be a global component, linked to the design structural organization. As a technique, it would be included as isolated components. The first approach would facilitate a global perception of game; the second one would provide playful situations accidentally.

Hunicke et al. (2004) described a procedure way to organize gamification. As a chain, the designers have to devise mechanics, that means procedures, ways, steps. These mechanics produce dynamics, that means interactions, reactions, behaviours. Finally, these dynamics generate aesthetics, that means emotions, feelings, experiences (Figure 2). Each component could be provided bay several ways. For instance, the mechanics could be explicated bay rules, means, objects, roles, etc.



Figure 2: MDA model (Hunicke et al., 2004)

From the learning resource's design (Rajadell & Sepulveda, 2011), gamification could be centred on learners, teachers, or means. When based on learners, gamification would be grounded on learners' activities, initiatives, or contributions. When based on teachers, they would be directed by teachers' orders, indications, or instructions. When based on means, means would generate playful feelings by themselves.

Following this approach, Feliz (2018) has described several strategies to carry out gamification. Basing it on learners, several techniques could be used:

- Election: Learners could elect among several options.
- Awards: Learners would reach goals and receive awards.
- Roleplaying: Learners would play as actors.
- Performance: Learners are presenting results by a non-conventional way, usually non textual formats.
- Creativity: Learners could generate own proposals according to their preferences.
- Collecting data: Learners could collect data to start activities from them.
- Researching: Learners would research by several ways o starting from several approaches.

Starting from means, several resources could be used:

- Apps: Applications, usually on smartphones and tablets, are based on gamification principles.
- Open: Offer activities with open ended happenings.
- Self-making: Provide opportunities to learners to do by themselves.
- Case studies and realia: Use real materials from real situations.
- Innovation: Promote self-thinking and creativity.
- Defamiliarization: Change contexts, positions, and locations to create unusual situations.
- Storage medium: Facilitate means, data, or texts through unusual platforms as social media.

Finally, centring it on teachers, several ways could be used:

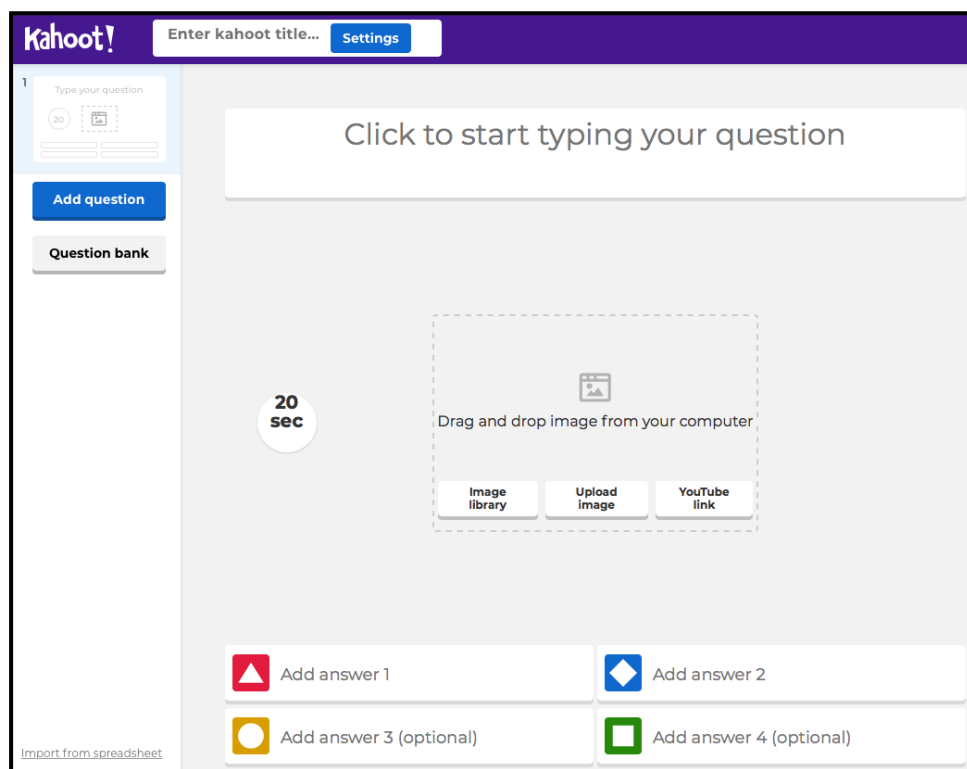
- Options: Offer optional ways to go in depth in the contents of special interest for them.
- Simulation: Simulate real situations, experiments, or problems to provide realistic contexts.
- Symbolism: Use symbols as mnemonic resources.
- Dramatization: Provide realistic situations to discuss or analyse.
- Imagination: Offer fantastic or unrealistic contents or situations to stimulate divergent thinking.
- Stories: Start from stories, narratives, diaries, or memories to provide realistic, credible contents.
- Competition: Organize competitive situations to stimulate rivalry among learners.

## **2. Gamification Tools & Resources**

### **Kahoot! (<https://kahoot.com>)**

Kahoot is a question-answer tool that engage students though quizzes, discussions and surveys. Students don't need an account to access and can access through mobile devices with internet connection (smartphone, tablet or computer). Students use a game pin number to join a specific game create by the teacher. However, teachers do need an account to create quizzes. Creating

a quiz, discussion or survey is quick and easy process. Each option is similar in how it is set up. Questions are projected on a shared screen, while an unlimited number of players answer the question, creating a social, fun and game-like environment in which participants compete against each other. This tool allows for the design of multiple-choice quizzes as well as polls and surveys. The quiz questions and polls stimulate quick decisions as well as whole-class discussion. As an assessment-based tool, Kahoot supports initial assessments, productive formative assessments and student reflection, through fun quizzing, quick polls and surveys. Scores are kept according to accuracy and response time, and top ranked players are revealed after each answer. The scoreboard at the end of the game displays the best ranked players with the number correct and can be exported as a document for teachers to save as a record.



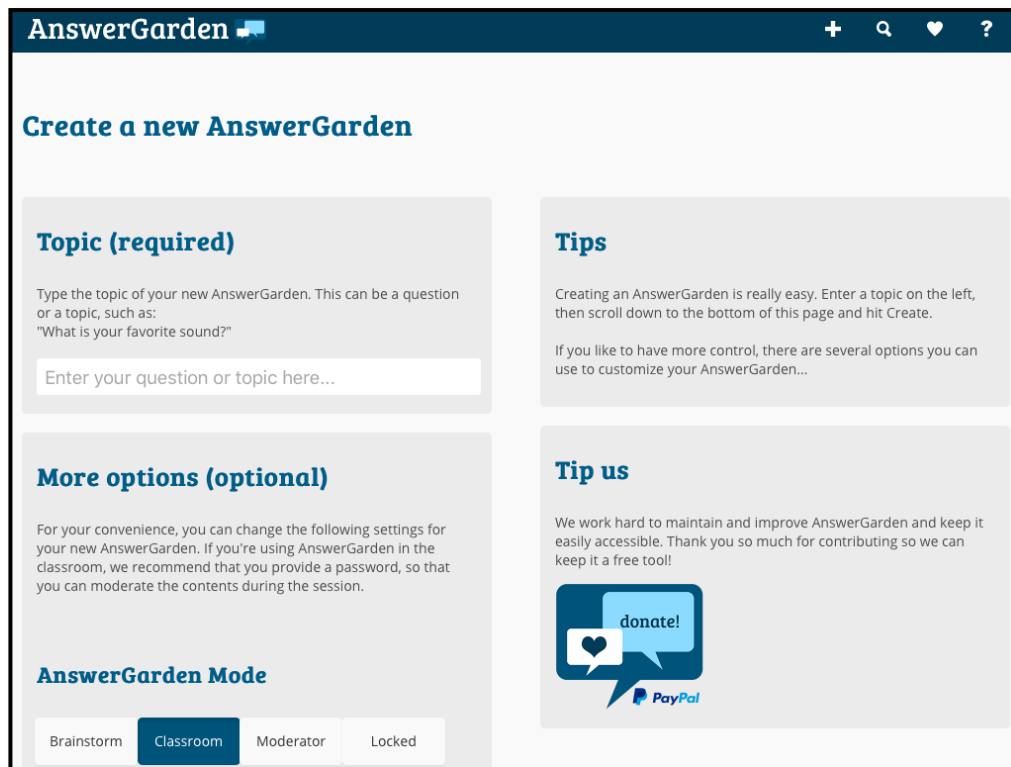
[Screenshot] Retrieved from <https://kahoot.com>

### **AnswerGarden (<https://answergarden.ch>)**

AnswerGarden is an easy-to-use tool for getting brief feedback from a group. It can be used to determine the knowledge level of students on a given topic. Users do not need to sign up for an account in order to use AnswerGarden. AnswerGarden can be used with different mobile devices with internet access. Once a question is typed in, students can submit answers on the website. AnswerGarden can be embed on a course or other website. Students simply key in their answers to the question or click on existing answers to create a word cloud of answers. Answers are limited to 20 characters so students must be succinct with their answers. Twenty-five answers are visible per garden, but if students submit the same answer, that word grows bigger. This tool can aid in formative and summative assessment by posting an open-ended thinking question for students to answer. It can be used to activate prior knowledge before a lesson and to determine the level of understanding following a lesson. Students can use this website to work collaboratively, such as brainstorming. This web site engages students by letting them see



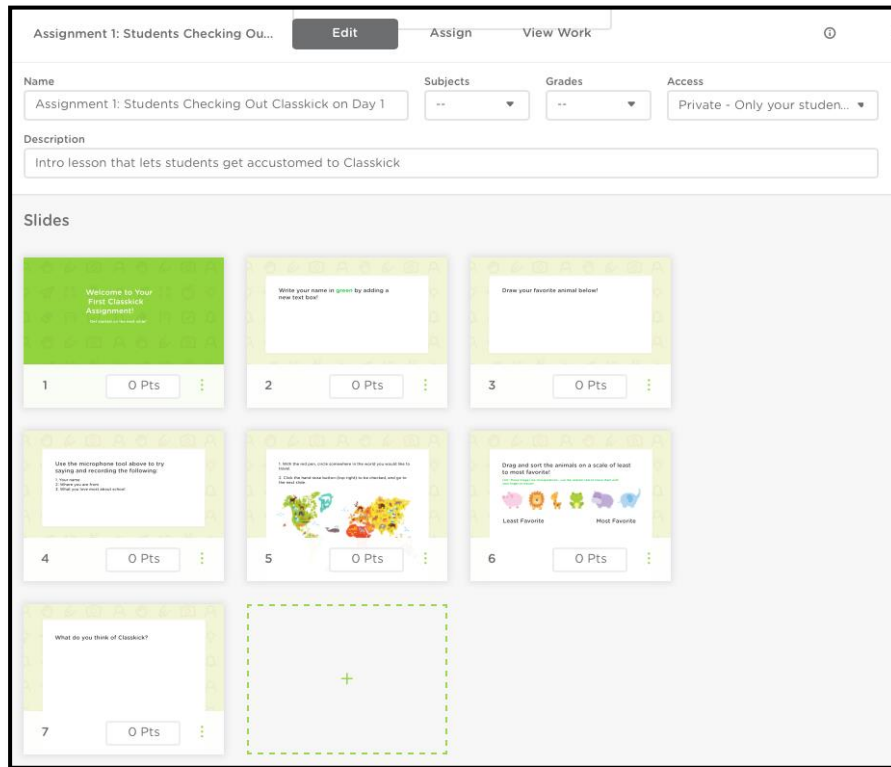
each other's answers. It also provides a good visual tool because if the same words are frequently keyed in as answers those words in the word cloud become larger. Although a simple resource, it has the potential to be used to wide range of education tasks, such as brainstorming, polling, synchronous and asynchronous communication, and formative assessment.



[Screenshot] Retrieved from <https://answergarden.ch>

### Classkick (<https://classkick.com>)

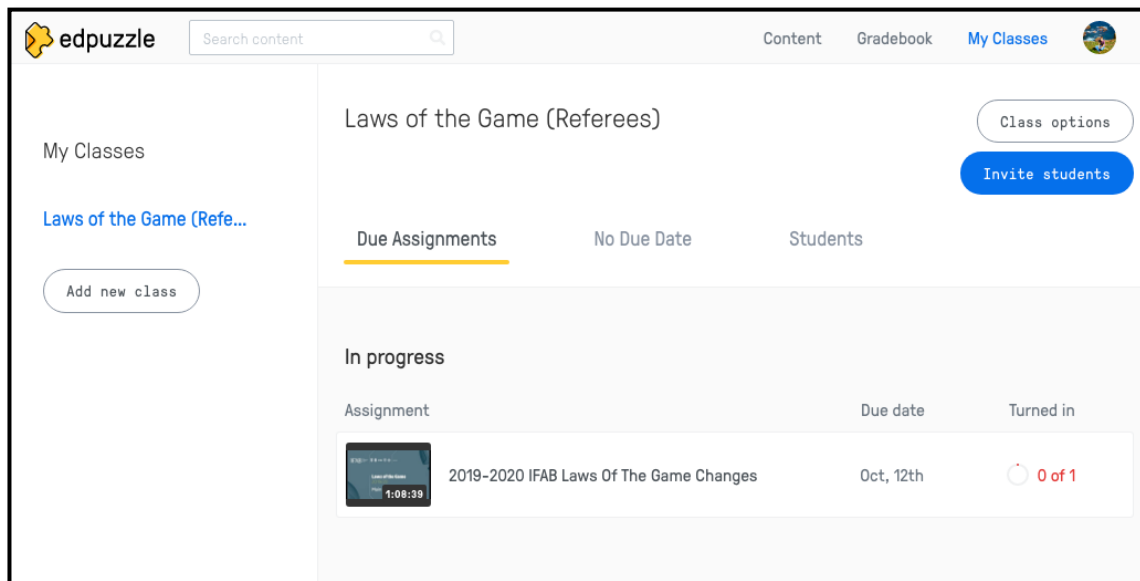
Classkick is a tool where students do their work or tasks and get formative feedback and help when they need it. Teachers can create, assign and assess the task or works online. Students work at their own pace and receive help immediately for their teacher and other students. Teachers can observe student progress in real time. The resource is so easy to use. Just create a teacher account and add your student roster. Teachers can create their own lessons with for almost any topic or lesson using their own worksheets, web content, audio and video. Teachers can see the whole class working at once on their device and see how each individual student is performing. The teacher is able to identify struggling students or students who are too shy to ask questions. And, students can work at their own pace. Students can ask questions and raise their hand privately by just clicking on a button. The teacher can even reteach a concept on the device so the whole class can see. Classkick is designed so students can help their peers. This feature helps them stay engaged even more. It is a great tool for synchronous and asynchronous communication, blended classrooms, personalized learning and cooperative learning.



[Screenshot] Retrieved from <https://classkick.com>

### EdPuzzle (<https://edpuzzle.com>)

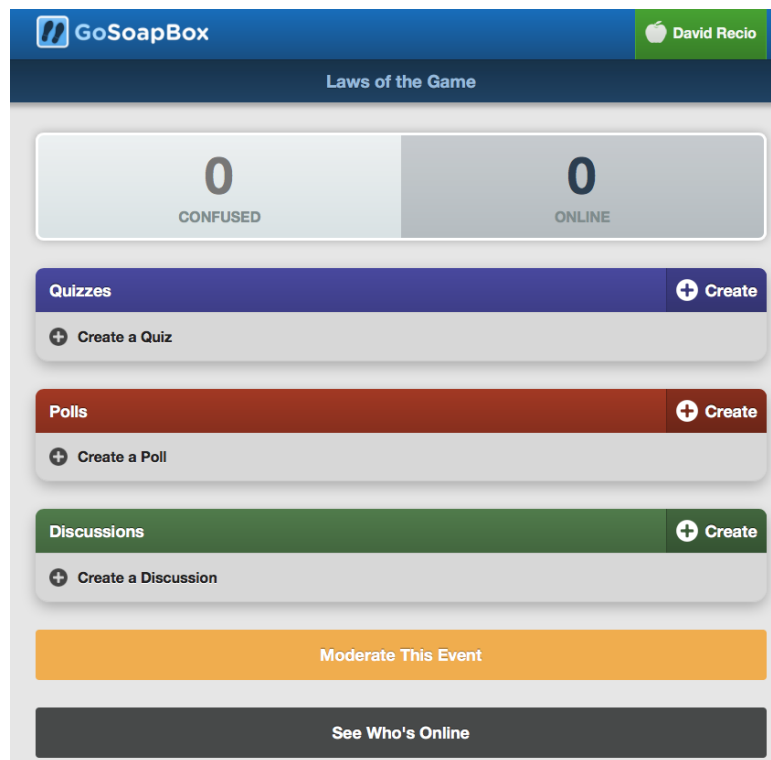
EdPuzzle is an assessment-centred tool that allows teachers and students to create interactive online videos by embedding either open-ended or multiple-choice questions, audio notes, audio tracks, or comments on a video. EdPuzzle interactive videos can be made with videos from a number of websites. Teacher crop the video and take only the part that need and pause the video and add an audio note. They can make a warm introduction or clarify a concept. Teacher can embed open questions or multiple choice that go along with the video. This is great to check the student understanding. Teachers can create a space where they share video-lessons. The students have access to this class only with the class code. Students do not need an email account, just a nickname. Any video assigned to this class, will be assigned to every student. EdPuzzle offer useful information for teachers. You can have individual information from each student. Who watched the video and who didn't understand the lesson? Students answer questions on a video. Teachers can enhance the videos they show in class by adding their own narration into the video to clarify concepts or highlight key points. Students use EdPuzzle to add multiple choice and open-ended questions to a video from the teacher. Once they have created their own interactive videos, students can exchange their videos with classmates, complete classmates' video quizzes, and provide feedback on the quality of their classmates' interactive videos. EdPuzzle is a great formative assessment tool for teachers who assign videos for homework or want to encourage asynchronous communication.



[Screenshot] Retrieved from <https://edpuzzle.com>

### GoSoapBox (<https://www.gosoapbox.com>)

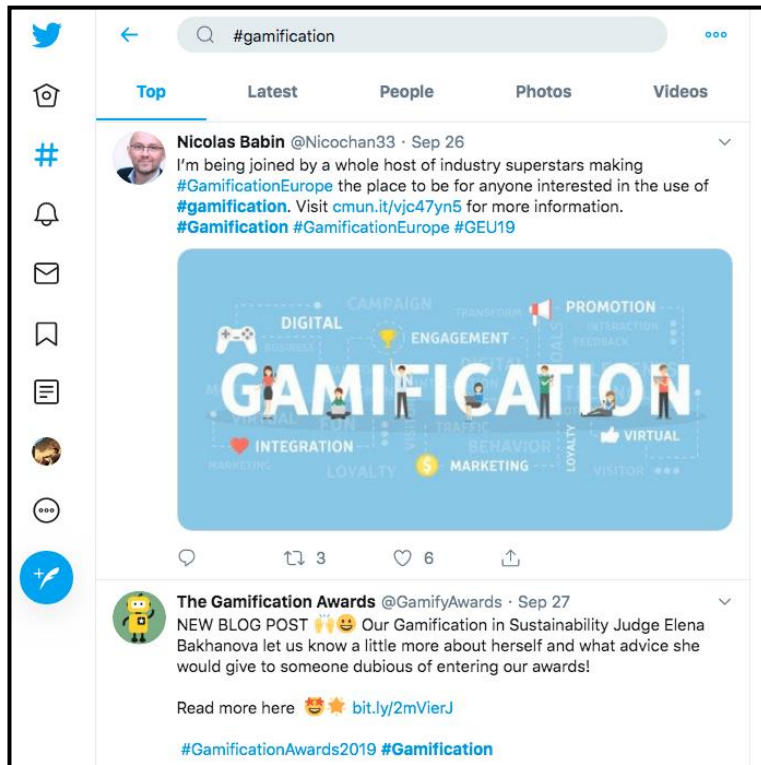
GoSoapBox is a web-based student response system. Provide a platform for both teachers and students to communicate. Teachers can create an event for students to join. Each event has its unique class code that you share with your students. Within each event, teacher choose which features are accessible to the students. Features can be quizzes, discussion questions, or polls. One particular feature, the confusion barometer helps students communicate anonymously whether they understand the topic. The barometer can be accessed during a lecture given, so students can provide instant feedback to let know whether they understand the content. Students can ask questions or vote for questions they would like to see addressed in class. Can be accessed on mobile devices with Internet. You can check your students' responses and comments outside of class. Students choose and vote for questions they want to see addressed in the class, allowing the teacher to adjust their lesson immediately. Students can provide immediate and anonymous feedback, so the instructor can modify the lecture accordingly to make teaching and learning more efficient. After a poll, the teacher can share the results with the whole class and have students analyse the results.



[Screenshot] Retrieved from <https://www.gosoapbox.com>

### **Twitter (<https://twitter.com>)**

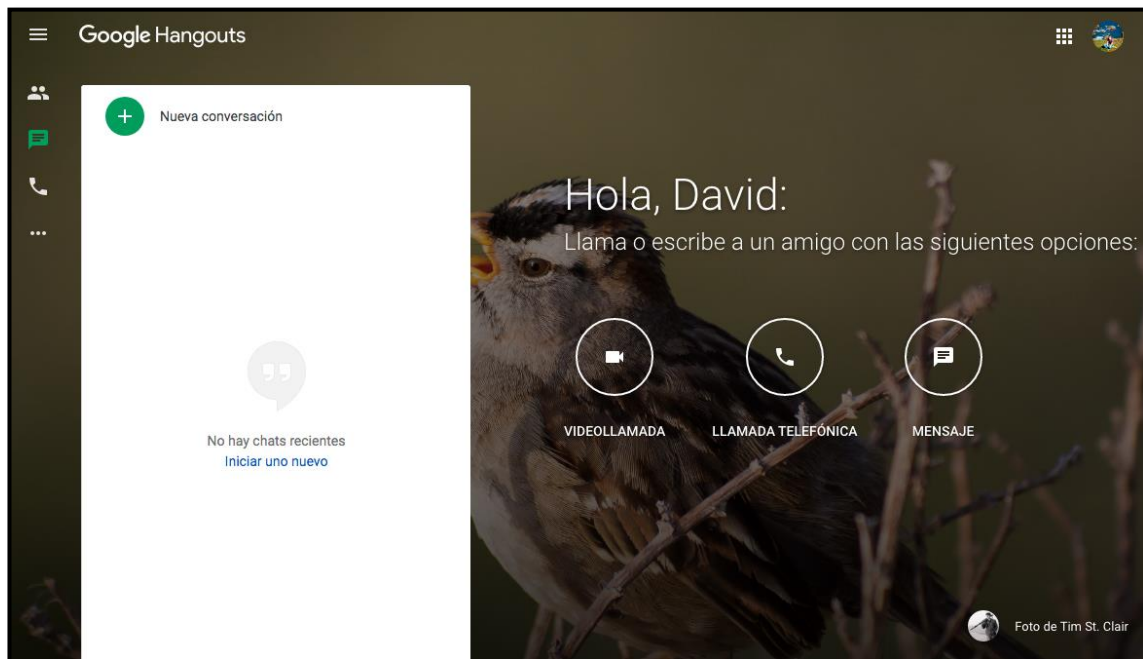
Twitter is a social networking tool that allows users to connect with people and explore topic of interest (#hashtags). Deemed as a community-based tool. Twitter users can read and write short messages (up to 140 characters) that are organized by hashtags (e.g., #gamification). It is one of the most popular professional learning tools for teachers. If you are struggling to get students to engage in conversations or to get full class participation, you might consider giving Twitter a try. It is a great tool for backchanneling, synchronous or asynchronous communication. This tool allows to add pictures and videos, which can be resources that facilitate dialogue and discussion on a topic. Twitter functions characteristically as a social network linking effective tools including learner-based, assessment-centred as well as knowledge-based online tools for instructors and students without constraint of time and space. This is a great community-based tool to promote students' learning. The tool can be accessed on the website or a wide variety of mobile devices



[Screenshot] Retrieved from <https://twitter.com>

### Google Hangouts (<https://hangouts.google.com>)

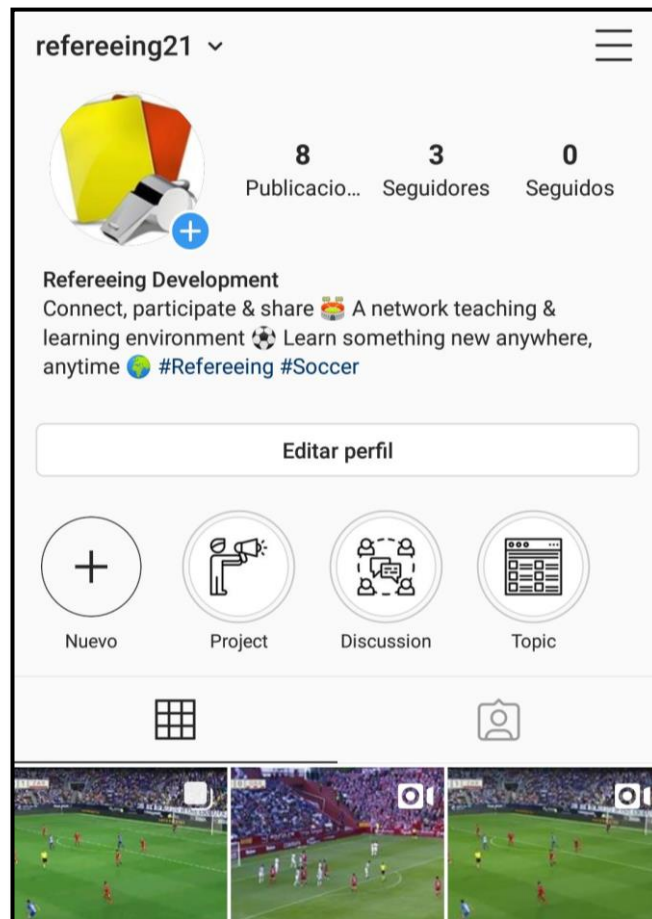
Google Hangouts is a video conferencing tool developed by Google that allows users to collaborate at a distance, instant message, video chat, and share photos, screenshots, and files. Google Hangouts allows conversations among up to 10 users at the same time. It can be accessed online or through mobile apps available. Chat histories and files are saved online, and they are available to be synced between different devices. For educators, Google Hangouts is a great tool to engage students in collaboration outside of the classroom. It overcomes geographical barriers and provides more opportunities for face-to-face communication. The Google Hangout user interface is well-designed and easy to figure out how to use without any instructions. However, users need to sign in with Google Account in order to start a conversation (e.g., video call, phone call and message). Students use Google Hangout to communicate with other students in the same space (rather than having a face-to-face conversation). Students use multiple modalities, including text, emoticons, photos, or drawings to enhance face-to-face conversations. Students in different states share files and screens to collaboratively work.



[Screenshot] Retrieved from <https://hangouts.google.com>

### **Instagram (<https://www.instagram.com>)**

Instagram is a free online tool and app that allows users to capture and share photos and videos with your friends and family. Instagram is one of the most popular social media channels. Teachers can tap into this powerful resource. Instagram is not just for personal use, it can also be used as an educational tool. Students take photos of their homework assignment (rather than write it down). Students can use hashtags to curate collections of photos or videos. Teacher can create educational resources to share with the students on Instagram account and generate discussion. Students leave comments on photos or videos and tag classmates in their comments. After making comments on posts or having discussions under posts, they can also analyse the archive of the discussions. Students can create videos demonstrating their knowledge about a topic and share these videos with a broad audience via Instagram to receive feedback.



[Screenshot] Retrieved from <https://www.instagram.com>

### 3. Conclusions

Gamification can be defined from a larger or shorter point of view. The first one facilitates a more useful and applicable strategy for learning. It could be considered as a structure or content, as a method or as a technique, and based on learners, teachers, or means. By any way, it can be a powerful tool to engage, motivate, and enhance learners in an immersive, playful experience. As suggested in several examples, gamification can be also supported by apps that connect quite well with learning environments and means used in open massive courses. Each teaching team has to decide how to use and insert them in the whole design of their courses.

### 4. References

- Beilin, H. (1992). Piaget's enduring contribution to developmental psychology. *Developmental Psychology*, 28, 191-204.
- Deterting, S. et al. (2011). From Game Design Elements to Gamefulness: Defining "Gamification". *MindTrek'11*, September 28-30, 2011, Tampere, Finland. Available at <http://bit.ly/2AJRU7q>
- Feliz, T. (2018). *Open Massive Gamification*. OpenupEd webinar. EADTU. Available at <http://bit.ly/2AHlh9l>
- Goethe, O. (2019). *Gamification Mindset*. Berlin: Springer.



Hunicke et al. (2004). MDA: A Formal Approach to Game Design and Game Research. *Game Design and Tuning Workshop at the Game Developers Conference, San Jose 2001-2004*. Available at <http://bit.ly/31NYtBY>

Information Resources Management Association (2016). *Teacher Education: Concepts, Methodologies, Tools, and Applications: Concepts, Methodologies, Tools, and Applications*. Pennsylvania: IGI Global.

Rajadell i Puiggròs, N. & Sepúlveda, F. (coord.) (2011). *Didáctica general para psicopedagogos*. Madrid: Universidad Nacional de Educación a Distancia.

## How to design a quality master's offer? The importance of knowing the students' motivation.

**Miryam de la Concepción González Rabanal**

Universidad Nacional de Educación a Distancia (UNED). España.

Email address: [mcgonzalez@cee.uned.es](mailto:mcgonzalez@cee.uned.es)

**María Violante Martínez Quintana**

Universidad Nacional de Educación a Distancia (UNED). España.

Email address: [vmartin@poli.uned.es](mailto:vmartin@poli.uned.es)

### Abstract

The implementation of the European Higher Education Area has opened a huge field following the Bologna process initiated in 1999, setting in motion a transformation mechanism that European universities have undertaken. This reform has tried to respond to the demands of globalization and the knowledge society. From here, the proliferation of master's degrees and the use of new technologies in learning and teaching have enhanced and diversified education and training, erecting distance methodology as one of the central axes throughout this process. Due to this new economic, social and cultural reality, the implementation and experience of official master's degrees has not always been as successful as expected. For this reason, it is interesting to find out the factors that can condition the success of the master's degree programs and to what extent they meet the expectations of the students. Given that there is not much information available, nor a wide bibliography to cover the understanding of the great uncertainties that are presented to us, the purpose of this research is to try to give answers to one of the main issues of today, as is the motivation of the masters' students, in order to determine how quality masters can be offered and to design an attractive offer of this type of teaching for the students. To this end, within the framework of the educational innovation group of the UNED (TIP 2016-16), a questionnaire has been prepared and applied as a pilot experience in three official Master's courses at the University.

**Keywords:** OFFICIAL MASTERS, STUDENTS' MOTIVATION, STUDENTS' SATISFACTION, SWOT ANALYSIS, OPEN DISTANCE LEARNING, EHEA.

### 1. Introduction

The transition towards the European Higher Education Area (EHEA) learning model has involved relevant methodological changes in face-to-face teaching as well as in distance learning since it was started.

If we add the technological progress to this transformation, which has enabled a global and open access to the academic community with just a click, the situation shows a different scene where professors must not only face the launch of new teaching methodologies and ways of teaching but also the design of unprecedented ways to connect with students' motivation. It is obvious that university professors find a gap between the requirements derived from the new methodological models and the knowledge of the students' motivation. Many times this gap translates into an ongoing decrease in the students' interest, with the resulting frustration of their expectations and the withdrawal from their studies. For this reason, it seems important to focus this proposal in the search of answers about the Master students' motivation in a university which bases its methodology on distance learning.

The document to be presented includes some of the results of the Project developed by the Teaching Innovation Group (TIG) 2016-16 during the academic year 2018-19 which consists on the *design and implementation of a questionnaire to improve the recruitment, support and monitoring of the Official Masters students in the UNED*<sup>1</sup>, which could also be applied to other universities, to find out, among others, their motivations when signing up for the official postgraduate studies, and hence be able to determine the guidelines to improve the offer and design of this training.

This Project responds to the concern in the UNED about increasing the number of postgraduate students and giving a better response to the information requested in the accreditation processes set up by the National Agency for Quality Assurance and Certification (ANECA) which, among other aspects, assess as a relevant element the level of satisfaction and the employability of the graduate.

Both questions require, according to this perspective, *to know the students' motivation* (González Rabanal y Martínez-Quintana, 2018) to enrol in Official Master studies and, in regards to this Project, to know why they choose the UNED.

For this purpose we have created a questionnaire which also seeks to determine –together with other supplementary methodologies- to what extent the UNED educational offer regarding postgraduate studies can be more attractive than that from other universities.

The logic of analysing this aspect lies behind the fact that if we know our students' motivation to enrol in a Master, the UNED will be better positioned to adapt its offer of Official Masters to the demand of the students and it could become an attractive proposal for the potential postgraduate students.

In addition, knowing the Official Master students' motivation can be very interesting for the students themselves as, derived from a better knowledge, they can obtain more accurate support and monitoring and it could help the UNED to design postgraduate courses according to the *preferences and expectations* of the students, hence increasing the number of enrolling and the continuity of distance learning.

Finally, so that the UNED can design a strategy with the aim of giving a better answer to the demands of the Official Masters students, it needs to develop its own SWOT analysis, which is also included in this document.

## 2. How to be competitive in Official Masters education

As some authors like Bedia (2012), Marroquín (2008) or Kawasaki (2011) have proved, in order to be successful in the market it is necessary to find the market niche in which the number of competitors is low or, if possible, non-existent. This allows you to have a privileged position in the market as your offer is exclusive and so the potential consumer will be willing to pay whatever the price. In economic terms this is called offer monopoly or just monopoly. But it is also known (Lipsey, 1989; Fischer-Dornbusch, 1985) that monopolies are associated to abusive situations for the consumer and most of the times, as they override competition between rivals, they place the plaintiff into a defenceless position, so they can only do but pay the price they are asked for –if they want to enjoy the good offered in such conditions.

Leaving out of consideration other relevant aspects in the field of economics (as is the case of natural monopolies), the aim of the laws of the market is, on the one hand, to boost competition, this is, to favour the existence of multiple nearly identical offers regarding the homogeneity of the good (the Official Masters) and, on the other hand, to favour the survival of the different offerors (the universities), allowing them to reach the necessary incomes for their activity to be profitable.

---

<sup>1</sup> UNED: Distance Learning National University.

It is in this context, *mutatis mutandi*, where the offer of Official Masters from different universities belongs nowadays. On the one hand, there is a wide offer as the number of academic institutions has increased due to the university autonomy and the implementation of the so-called "Bologna model". As a result, there is a tendency to offer a very similar product in which the use of on-line tools is not exclusive anymore (it was virtually in the hands of the UNED before).

On the other hand, it is necessary for all these institutions that offer very similar academic products to be able to guarantee a *market share* which enables them at least to make sure that they have financial sufficiency in the medium and long term. For this purpose, the market laws recommend the *product differentiation* or, in other words, to change from a perfect competition to a monopoly competition, this is, to offer a very similar but different product or at least that the potential consumer (the student) feels that it is different. There are two examples that prove this statement: coffee shops and hair dressers. Both businesses offer virtually identical services, but they foster *customer loyalty*, which enables them to survive in the market.

In this sense, economics and sociology sciences can together provide some key factors to gain success, that is to say, although all the universities offer a very similar product (Official Masters) to the potential students, it is necessary to offer a distinguishable and quality product, either because it is really so or because the potential customer (the student) economically or sociologically feels so<sup>2</sup>.

A key element for this purpose is *on-line and word-of-mouth advertising-marketing of the Official Masters*. Those who are devoted to this task (Bassat, 2006; Kotler, 2017; Kotler y Keller, 2012) know how important this is in order to transmit direct messages to the customers or, even more useful most of the times, more efficient and subliminal messages that convince them what they are offered is better than other apparently similar options from the competition. No room for doubt, the use of advertising is essential to gain possible customers in the future, but something else must be added in order to gain their loyalty and make them become the best advertisers themselves for the product.

In this project, for Official Masters courses, we have created and applied a theoretical-practical model that starts with a SWOT analysis in order to determine which the Strengths, Weaknesses, Opportunities and Threats of the UNED are by comparison with other Spanish universities. Afterwards, we have come to a diagnosis of the motivational, perceptual and behavioural reality of the students to finally develop a *quality Master strategic design* that joins together the interests of all the necessary parts.

The previous knowledge of the *customer profile* (potential students) to whom the Official Masters offer is directed and the approach to the motivations and perceptions of the Official Masters students in the UNED have been developed during the academic year 2018-19 through a Teaching Innovation Project (TIP 2016-16) which consist on the *design of a questionnaire to improve the recruitment, support and monitoring of the Official Masters students in the UNED by means of their motivation assessment*.

The following process has been applied:

1. SWOT analysis carried out by the UNED.
2. Main contributions derived from the implementation of the questionnaire answered by the students of 3 subjects from 3 UNED Official Masters.
3. Proposal of possible lines of action that can be taken into consideration by the UNED academic leaders in order to improve their Official Masters design, adopting the most suitable strategy to

---

<sup>2</sup> We are not dealing here with the analysis of the ethical part of this strategy, but with the efficacy of it in order to gain clients (students), which is one of the aims of marketing.

place the UNED in a position of comparative advantage compared to the other universities which are its potential competitors.

This process would imply the following stages:

- Design of the strategy.
- Participation of all the parts affected by the strategy.
- Dissemination of the strategy (Advertising Planning): a) Internal; b) External (advertising campaign that highlights the UNED Official Masters courses compared to the other offers).

### 3. The need to make a good diagnosis: a SWOT analysis of the UNED

The SWOT analysis (Strengths, Weaknesses, Opportunities and Threats) provides a wide view of the institution analysing it in its own environment and highlighting its strengths and weaknesses (which derive from its internal functioning) and the opportunities and threats that affect the institution from the outside and could be used in its own favour (opportunities) or would mean that it must succumb (threats).

Under this premises, the following SWOT analysis has been carried out (see Table 1).

**Table 1: Proposal of SWOT analysis in the UNED.**

<b>STRENGTHS: What does the UNED do better than other universities?</b>	<b>WEAKNESSES: What disadvantages does the UNED face compared to its competitors?</b>
<ul style="list-style-type: none"> <li>• It has a wide career in on-line teaching. Prestige.</li> <li>• It has a wide national and international presence.</li> <li>• It has a great support to carry out its courses for the students through the Associated Centers.</li> <li>• It provides attention to diversity and special educational needs (foreigners, handicapped, inmates).</li> <li>• It has a great capacity to overcome time and place barriers for studying.</li> <li>• It has a great experience in the design of material for self-learning, use of multiple tools and technology.</li> <li>• It has a great capacity to expand without needing great investments for facilities.</li> <li>• It needs less marginal costs to attract new students than face-to-face universities (no additional room for classes is needed, and it is not necessary to change the structure of the exams).</li> </ul>	<ul style="list-style-type: none"> <li>• Financial model which is not consolidated (it depends on the enrollment).</li> <li>• Resistance to changes.</li> <li>• Aged staff, both among Administration and Services Staff (ASS) and professors, which sometimes means a low knowledge of new technologies and resistance to change.</li> <li>• Poor specialized computer support and poor collaboration between professor/ASS/computer technician to create work teams.</li> <li>• Too much bureaucratization.</li> <li>• Lack of coordination.</li> <li>• Shortage of computer resources/need of updating and recycling on-line resources and tools.</li> <li>• Lack of staff motivation.</li> <li>• Low flexibility to adapt to the new students demands.</li> <li>• High initial costs that make it difficult to implement new studies with few students.</li> <li>• Refusal to review materials (every 4 years) which can lead to its gap, lack of update and poor incentives for authors as exiguous copyright.</li> <li>• Poor capacity to benefit from the assessment feed-back.</li> </ul>

	<ul style="list-style-type: none"> <li>• Little chance of <i>physically</i> interacting between the students and between them and the professor (only during face-to-face lectures, increasingly scarce).</li> <li>• High operating cost (derived from the continuous need to update ICT) and high technological risk (total dependence as its services are outsourced and it works with its own platform, not compatible with other more widespread platforms in the university sector, such as Moodle).</li> <li>• Weakness in the teaching of technological and science studies, which require facilities to carry out the practical part and a more personalized monitoring of students learning.</li> </ul>
<p><b>OPPORTUNITIES: Is there any market niche<sup>3</sup>? Can costs be reduced?</b></p>	<p><b>THREATS: Is it difficult to supersede the competing universities?</b></p>
<ul style="list-style-type: none"> <li>• Possibility to create synergies with other institutions which are also domestic and directly depend on the Ministry.</li> <li>• Increase in the demand of specialized on-line courses.</li> <li>• Increase in the willingness to study, as a consequence of the higher unemployment rate of the young population and the need to recycle and update their knowledge to be up to date at work.</li> <li>• Low cost of the development and review of the already existing studies thanks to technology.</li> <li>• Low cost of asynchronous interaction between students and between them and professors thanks to the advances in communication tools.</li> <li>• Chance to offer high quality international programs at low cost thanks to the possibilities offered by technology.</li> </ul>	<ul style="list-style-type: none"> <li>• Lots of competition: on-line offer from other universities.</li> <li>• Lack of students.</li> <li>• Difficulties to attract external resources.</li> <li>• Possible lack of control of high technology costs as a consequence of the externalization of the services.</li> <li>• Risk of undermining the need for sound educational thinking due to the new technological tendencies.</li> <li>• Low capacity to find market niches due to the inflexibility of the systems associated with university education and the excessive bureaucratization of the processes.</li> </ul>

Source: own elaboration.

<sup>3</sup> Market niche is a marketing term used to refer to a portion of a market segment in which individuals share similar characteristics and needs that are not fully covered by the general offer of the market.

Obviously, from this analysis possible action lines can be established, lines that integrate the UNED long-term action strategy in order to consolidate and widen its education offer for Official Masters, as we will show in the last part of this document.

#### 4. Main contributions derived from the Teaching Innovation Project (TIP) 2016-16: the development of a questionnaire to improve the recruitment, support and monitoring of Official Masters students.

Although there have been three stages in the development of the project<sup>4</sup>, in this work we present some results from the last one, which has consisted in applying the questionnaire to the students of three subjects of three UNED Official Masters with a professional and research character, based on the general trends of the basic theoretical framework.

##### 4.1 Basic theoretical framework

For the approach and study of the motivation and its assessment we have started from a theoretical frame of basic contributions which consists of a review of specialized literature on the subject in order to create a theoretical frame where we can include our study with three working hypotheses. The approach to the study of postgraduate students' motivation lies on, among others, the assessments carried out on adults by Tapia, Montero and Huertas in 2000.

It is found that the evolutionary trajectory of motivational studies in the Master programs has gone along with those of satisfaction, and the first analysis can be found at the end of the 80s in the XXth century, focused in finance, the factors that enhance remuneration and those of the market. Theories such as Ajzen *planned behavior* (1988) (*The Theory of Planned Behavior*) are applied to find out the elements that influence the students who wish to start their specialization studies in the financial and other related areas. Ajzen theory develops the idea that individuals act according to their intentions and the perception they have about the control of their own behavior. Intentions are influenced by three components: personal attitude, subjective rules (perceptions and social pressure) and the perception of their own control of their behavior.

Tan and Laswad (2006) apply the *theory of planned behavior* and discover that the attitude towards finance studies depended in fact on personal factors, beliefs and opinions about other individuals (who acted as social models) and the difficulties for controlling their own behavior. With a parallel perspective, Felton, Buhr and Northey (1994) analysed the factors that influenced the students in the business area regarding the election of finance studies instead of other studies of the same area. Students chose these studies taking into account the long-term profits and the working conditions. Other analysts (West, Newell & Titus, 2001) research about the intrinsic factors in its association with satisfaction at work, as well as the external factors related to economic reward and the availability of jobs. Acknowledgement appears in the information they gathered from the stages in the decision process of the marketing student.

Actually, there is not too much bibliography about the topic of deciding to study a particular Master, although it is accepted that it is generally a long and complex process. Donaldson and McNicholas (2004) studied the reasons why postgraduate students continued their specialized training studies in Great Britain. For this purpose, they suggest a model of the relation between the postgraduate student decision process to buy and the communication strategy in marketing. Through this model the authors find out that the motivating factors to continue the studies relied on the improvement of the perspectives of the career and

---

<sup>4</sup> A pilot experience, derived from the implementation of the questionnaire in the University of León, a second stage carried out in the discussion forum line 1 of the UNED Xth Research Meeting on Teaching Innovation (November 2018) and the third experience which is mentioned in this document.



the remuneration and skills acquisition to get a better job. In the same way, programs accreditations and the reputation and location of the universities were also important when making a decision.

From a comparative perspective, Mai (2005) applied an analysis about the postgraduate students perception and satisfaction in Great Britain and the USA, focusing attention on their expectations, their perception of quality and the factors that affect students satisfaction. On this matter, Arambewella and Hall (2008) found out that the elements which take part in the prediction of students satisfaction were: education, technology, economy, social aspects, lodging, security, prestige and image.

Thompson and Gui (2000) researched about motivation differences by gender, age, previous education and professional experience, going this way beyond former researches which were focused on aspects related to the improvement of the salary or earning their colleagues' respect. There is another kind of researches that refer to the relationship between quality and education, due to the importance of the certificates of quality; they analyse –through the quality model- the relationships between the student satisfaction, the assessments of teaching and the evaluation of the program (Quentin, 2000). In the same way, the elements related to the quality of teaching are examined, comparing Australian students perceptions to other international students, and the following factors of quality were given: teaching, course contents, justice in assessment and intellectual incentive (Gatfield, Barker and Graham, 1999).

Sánchez, Pintado, Talledo and Carcelén (2009) made a deep review of the scarce literature about postgraduate education using many elements and analysis tools. In this sense, they highlight quality techniques (interviews in depth) in the researches about the motivation for buying and consuming in education, and quantity techniques (structural equation models; exploratory factor analysis; confirmatory factor analysis; structural equation models to analyse the influence of gender and motivation factors in students who wished to enroll in open learning; cluster analysis to study the relationship between students attitudes and aspirations regarding finances; discriminant analysis to assess the factors that distinguish the students groups and longitudinal studies to get to know the assessment of the students characteristics and their perceptions) and finally, the structural equation model combined with the Servqual (*Service Quality*), which analyses the differences between expectations prior to buying and perceptions after buying.

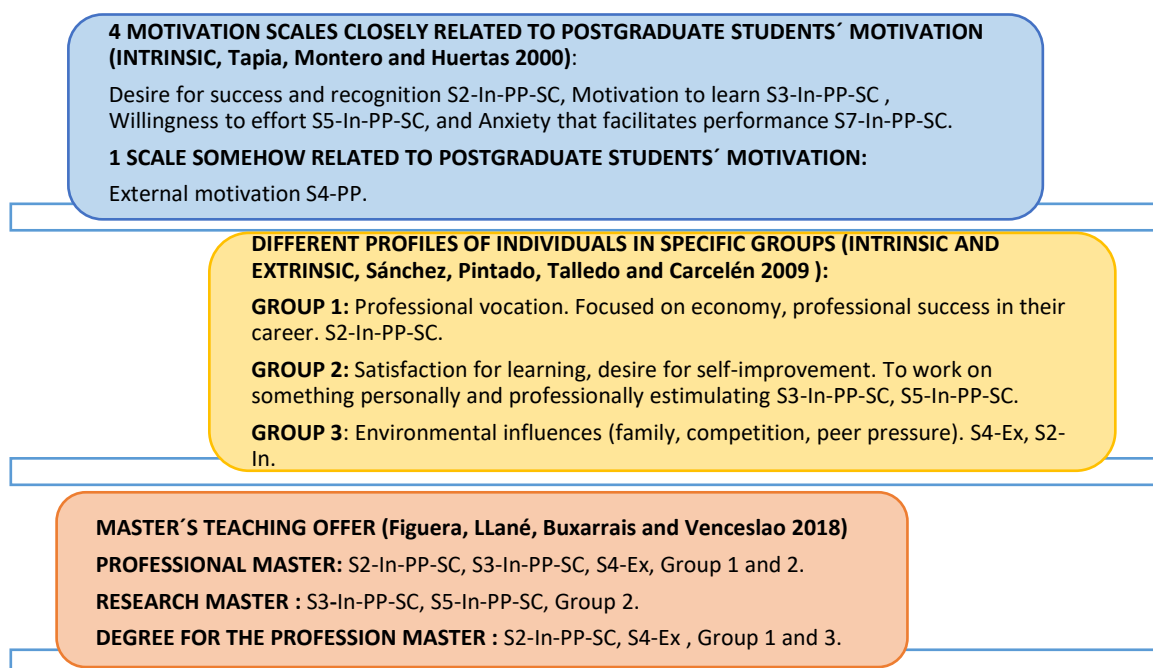
More recently, Hernández, Jiménez, Guadarrama and Rivera (2016) studied the postgraduate students perception in tutorials in order to identify the factors that influence motivation and satisfaction regarding the job done by the thesis director (tutor), with the aim to identify those elements that could be improved. In the analysis of the motivations in postgraduate studies 8 main aspects were found out: 1. Security, 2. Membership and Attachment, 3. Acknowledgement, 4. Achievement, 5. Power, 6. Knowledge, 7. Self-fulfillment and 8. Change.

Furthermore, Figuera, Llanes, Buxarrais and Venceslao (2018) carried out a research focused on analysing the profile, motivation and academic satisfaction in the Social and Legal Science Master studies in the University of Barcelona and the Autonomia University of Barcelona; this work represents an explanation for the Masters development and consolidation in Spain after the implementation of the European Higher Education Area. In this work we can appreciate the increase and diversification of the Masters that affect the students regarding their access profiles, age of access and previous career, and the increased dropout. Therefore, the theoretical model for our work comprises three analytical categories that specialized literature has proved as relevant and participant in the assessment of Master students' motivation, applied in the Teaching Innovation Project (TIP 2016-16) by González Rabanal and Martínez-Quintana (2019).

As shown in Figure 1, the motivational differentiation framework comprises three dimensions. The first one refers to motivation scales related to the evaluation of postgraduate students' motivation, the second

dimension comprises the different profiles of the individuals related to intrinsic and extrinsic factors<sup>5</sup>. Finally, the third dimension focuses on the training offer of the Masters. In short, the motivational differentiation framework with its three dimensions (motivation scales, specific groups and Master offer) represents an approximation to a theoretical model on which we can base the assessment of motivation. The second dimension –which analyses the different individual profiles in specific groups- lies in a central position and it has the biggest explanatory weight as it contains the motivation scales and it is included in the typology of Master. In turn in the process of learning in the postgraduate education we must consider the *intrinsic factors* related to individual, psychological and educational aspects, and the *extrinsic factors* related to institutional, sociological, economic and labour market aspects, which will dominate the context where the basic processes of incorporation into the teaching system and its link with the labour market requirements are developed.

**Figure 1: Motivational differentiation framework according to the motivation scale, individual profile and teaching offer of the Master.**



Source: own elaboration according to Tapia et al. (2000); Sánchez et al. (2009) and Figuera et al. (2018). S: Scala; In: Intrinsic factors; Ex: Extrinsic factors; PP: Performance, participation; SC: Satisfaction for the effort and compensation.

Consequently, the hypotheses of our research focus on this framework of motivational differentiation depending on the intrinsic and extrinsic factors, which have guided the three stages of inquiry and analysis, and which are articulated as follows: 1. Starting hypothesis: The application of the questionnaire on students' motivation provides essential information to improve the recruitment, support and monitoring of postgraduate students. 2. Central hypothesis: The search for knowing the Master students' motivation

<sup>5</sup> Extrinsic: it is external to the nature of a thing. External, it comes from the outside, not essential or improper of a thing. It is related to institutional, sociological, economic and labour market aspects, which will dominate the context where the basic processes of incorporation into the teaching system and its link with the labour market requirements are developed.

through a questionnaire favors a better organization, recycling and permanent design of postgraduate studies. 3. Consequent final hypothesis: The search for knowing the Master students' motivation through a questionnaire that improves the recruitment, support and follow-up of the motivation and expectations scales, influences favorably on student satisfaction during the learning process.

#### 4.2. Methodology: Design and implementation of the questionnaire

The quantitative methodology adheres to a descriptive constant analysis of the answers to the questions and the determination of the frequency of them, as well as a qualitative methodology of open questions applying several analysis of the content. The questionnaire first seeks to probe the psychodemographic and educational characteristics and the prior students' motivations when enrolling in a Master course and making the decision to join; to detect the procedures and access obstacles they have faced, the requirements and admission and then to approach the perception of the appeal that the university (face-to-face or not on-site) has for them and on-line teaching. Finally, to know whether their expectations have been fulfilled, the follow-up work they are doing of the Master structure and contents and the improvements they would include. For this purpose, the content has been divided into six rubrics: student profile, motivation, formal aspects regarding the Master (accessibility to the Master, access requirements and admission to the Master), appeal of the university and on-line teaching, structure and contents of the course and expectations about the Master. It includes 29 questions, where 8 are closed-ended questions, 6 are multiple-choice and assessment questions and 15 are open questions.

The field work was carried out step by step at the end of January, February, March and the beginning of April 2019 by three professors of the teaching innovation project. The field work is divided as follows: Subject *Theoretical Paradigm of Social Problems: from Merton to nowadays* (number of students: 44, number of participants in the teaching innovation project: 31, launch of the questionnaire: 23rd January 2019). Subject *Project Management and Crisis Management* (number of students: 32, number of participants in the project: 19, launch: 28th March) and subject *Budget and Governance in the European Union* (number of students: 6 in Spanish and 13 in English (19), number of participants in the teaching innovation project: 4, launch of the questionnaire: 5th April 2019). Total number of students in the three subjects: 95. Total students participating in the teaching innovation project: 54 (57%).

#### 4.3. Main results

Table 2 shows the motivations of the students of the two most numerous subjects who answered the questionnaire.

When analysing the results, in the first subject (Theoretical Paradigm) the most outstanding item is to expand academic knowledge (78%), followed by improving their professional career (58%), take the course for personal satisfaction (48%), work with the best professionals in their field (16%), make personal contacts and professional relationships (13%) and improve their economic expectations (13%). As stated before, it is the oldest group of students of the three in the subjects chosen for the field work and we can see that their priority is to expand their academic knowledge as they need it in this moment of their career and personal life, also encouraged by the motivation to improve their professional career and personal satisfaction.

In the second subject (Project Management and Crisis Management), students find it very important to improve their professional career (58%), personal satisfaction (58%), to expand their academic knowledge (47%) and stand out in the professional environment (42%). In a more secondary way, the wish to work with the best professionals in their field (15,5%), to improve their economic expectations (10,5%) and make personal contacts and professional relationships (5%). The students in this subject are mainly male, younger than the students in the prior subject and they belong basically to Group 1, with professional vocation and focused on professional success in their career and economically, although they are also part of Group 2 as

they are motivated by the satisfaction of learning and work in something personal and professionally satisfying.

**Table 2: Motivation to study a Master in the UNED, (Absolute and %) 2019.**

Which was the reason to take the Master in the UNED?	1.Theoretical Paradigm of Social Problems (31)					2.Project Management and Crisis Management (19)					3.Budget and Governance in the European Union (4)				
	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1.To expand academic knowledge.	-	-	2 6%	5 16%	24 78%	-	-	4 21%	6 32%	9 47%	-	-	-	1 25%	3 75%
2.To stand out in the work environment.	3 9,7%	3 9,7%	3 9,7%	10 32%	12 39%	-	3 16%	1 5%	7 37%	8 42%	-	-	3 75%	-	1 25%
3.To improve my professional career.	2 6%	-	3 10%	8 26%	18 58%	-	1 5%	3 16%	4 21%	11 58%	-	-	-	1 25%	3 75%
4. To make new personal contacts and expand my network of professional relationships.	10 32%	7 23%	4 13%	6 19%	4 13%	1 5%	6 32%	7 37%	4 21%	1 5%	3 75%	-	-	1 25%	-
5.To improve my economic expectations.	5 16%	6 19,5 %	10 32%	6 19,5 %	4 13%	2 10,5 %	3 16%	8 42%	4 21%	2 10,5 %	1 25%	1 25%	1 25%	1 25%	-
6. To work with the best professionals in my field of specialization.	10 32%	4 13%	7 23%	5 16%	5 16%	-	3 16,5 %	7 37%	6 32%	3 15,5 %	1 25%	2 50%	1 25%	-	-
7.For personal satisfaction.	1 3,5%	1 3,5%	5 16%	9 29%	15 48%	1 5%	-	3 16%	4 21%	11 58%	-	-	-	3 75%	1 25%
8.Other reasons.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Source: own elaboration by the UNED Teaching Innovation Project (TIP 2016-16), 2019. Assessment of the following aspects from 1 to 5, where 1 means less important and 5 great importance.

In the third subject (Budget and Governance in the EU), three quarters of the students wish to broaden their academic knowledge and improve their professional career, followed by the motivation dealing with personal satisfaction. They belong, just like the students in the first subject, to Group 2, although the population is different as they are younger and they are in a professional path of continuity in the first educational stages of professional learning.

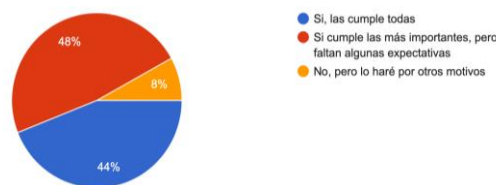
As a general conclusion of the results of the experience carried out, it can be said that the motivation to study the Master starts with the search of the information through the web, followed by friends and acquaintances, which is a usual option at university. In the case of the UNED, a third way to access information is through the associated centres, which play an essential role regarding direct contact with students.

When students are asked about the reasons to take a Master, the first option is to broaden their academic knowledge, the second to improve their professional career, the third one is personal satisfaction, and then to improve their economic expectations, to make personal contacts and professional relationships, to stand out in the professional environment and to work with the best professionals in their field.

The students in the first two subjects completely agree with the statement that distance learning has more advantages than face-to-face learning; they have been students in the UNED who like this type of learning and they do not agree with the idea that it does not have any advantage when compared to face-to-face learning.

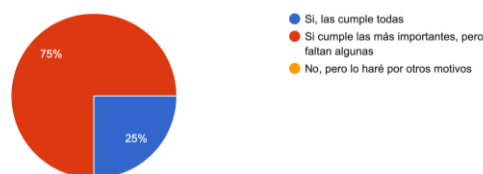
Finally, the topic of expectations is essential, as they represent the possibilities to fulfil the objectives they have set for themselves, so if the expectations are not met, they could feel disappointment and discouragement about the effort they must make to gain the Master degree. It is for this reason that they were asked if the Master they have chosen fulfils the expectations they had; 48% of the students of the subjects Theoretical Paradigm and Project Management and Crisis Management answered yes, 44% said that it fulfils all of them and 8% think that it does not fulfil them, although they are taking the Master for other reasons (Figure 2). 75% of the students of the subject Budget and Governance in the EU say that it fulfils the most important expectations, but some are still missing, and 25% think that it fulfils all of them (Figure 3).

Figure 2: Expectations in the Master and considerations about them among students in Theoretical Paradigm and Project Management and Crisis Management in the UNED (%), 2019.



Source: own elaboration: Yes, it meets all. Yes, it meets the most important, but there are some expectations missing. No, but I will join for other reasons

Figure 3. Expectations in the Master and considerations about them among students in Budget and Governance in the EU in the UNED (Absolute), 2019.



Source: own elaboration: Yes, it meets all. Yes, it meets the most important, but there are some expectations missing. No, but I will join for other reasons

Apart from these results, it must be added that in the open question about mentioning other reasons students name aspects such as: the possibility to find a balance between their studies and their professional and private life; to expand their knowledge on the issue; to improve their professional expectations; to have additional and complementary training apart from the university degree, more focused on the problems of society; to improve their knowledge on the topic; to learn how to carry out research work; to have more

postgraduate training; to add theoretical knowledge to the practical knowledge gained after many years of work in a company; to improve academic and professionally ...

In conclusion, according to the results, the starting hypothesis is confirmed as with the application of the questionnaire about students' motivation essential information to improve recruitment, support and monitoring of postgraduate students is gathered. The information given by these students can contribute to create a better structure of the organization of the Master, to recycle it and to design it according to their comments (central hypothesis). Also, the information gathered from their opinions and statements about their initial expectations and the fact that despite everything they will continue with their postgraduate studies favorably influences students satisfaction during the learning process and the experience and knowledge acquired (final hypothesis).

##### 5. Proposal of strategic action for the UNED in the area of Official Masters.

After the information gathered from the SWOT analysis and the implementation of the questionnaire, it is concluded that the UNED must create a strategy focused on boosting its strengths, minimizing its weaknesses and taking advantage of the opportunities available in its environment, as well as trying to neutralize its threats. No room for doubt, with this extremely ambitious and difficult purpose it is evident that the strategy should be composed of a *set of measures chaired by two fundamental ideas*:

- Review the Official Master training model according to the needs of the market.
- Seek as much coherence as possible between the curricula (not only the third cycle) and the demands of the labour market in order to improve students job opportunities.

In this sense, after knowing and analysing the results obtained from the aforementioned Project, we consider that the strategy to be adopted should include the following aspects:

- The possibility to "customize" the Masters offer according to the students' needs. This could be done by increasing the number of optional subjects or even allowing the students to follow subjects from other Masters.
- To design the Masters with a modular format in order to respond to the needs of *recycling and updating of students' knowledge*, including former students.
- Consequently, to establish collaboration with companies and the most active productive sectors for the creation of jobs with the purpose of improving the degree of employability of graduates, following the criteria of the National Agency for Quality Assurance and Certification (ANECA). In short, to work on demand in order to ensure the recruitment of students willing to take a Master because they maintain a close relationship with the needs of the companies where they are working or where they could work when they finish their studies.
- To consolidate a Master offer in which the UNED is really competitive. This implies analysing the results of the latest editions, analysing the evolution of the number of enrolled students and, of course, knowing the degree of satisfaction of graduates.
- To design measures for student retention and loyalty, keeping in contact with them in order to find out if their expectations have been fulfilled and decide, based on their own personal experience, which improvements should be made to the studies in order to give a better answer to the demands of the labour market. Such contact is a very important resource for the university to be able to access updated and verified information about what is happening in the business field, which is even more agile and reliable than the information coming from institutional collaboration between university and businesses.



- To remove technological obstacles both for those involved in teaching and managing the Masters as for students. To create work teams that integrate teachers, administrative staff and computer technicians is essential to be able to provide an agile and customized answer to the needs of every Master: neither all Official Masters are the same nor the profile of their students is similar, nor of course their expectations...
- To optimize strengths that include the network of Associated Centres and the tutors and teachers staff. Although it is true that access and communication between teachers and students have become cheaper and more agile in a great deal thanks to new technologies, it is also true that personal contact humanizes the learning process and teachers support makes it so. On the other hand, the plural and diverse origin of teachers, many times professionally connected with non-academic environments, is a very interesting enrichment element to obtain very important and clear information which helps design a strategy aimed at improving the third cycle educational offer in the UNED<sup>6</sup>.

## 6. Conclusions

- It is confirmed that the evolutionary trajectory of motivational studies in the Masters programs has evolved together with the satisfaction ones and that the first analysis were developed at the end of the 80s in the XXth century, focused on the finance field, the factors that enhance remuneration and market factors.
- Any study about the possible improvements that could be implemented in the Masters offer in the UNED must start with a SWOT analysis of the institution in order to know the scene where they would be developed and the possibilities of success, that is to determine the *market niche* at which they are aimed.
- Students consider the official Masters offer of the UNED, in the first place, as an option to expand their academic knowledge; in the second place, as a mean to improve their professional career; in the third place, as an instrument to boost their personal satisfaction and then they mention the improvement of their economic expectations, the possibility of making personal contacts and professional relationships, stand out in the professional environment and work with the best professionals in their field as other motivational elements.
- The motivation to take the Master starts with the search for information on the web site, followed by friends and acquaintances, which is a very much used option at university. In the case of the UNED, a third way to access information is through the associated centres, which play an essential role regarding direct contact with the students.
- Students feel that distance learning is more demanding and requires more dedication and self-discipline and this is not easy for everyone and it depends on their capacities. Taking distance courses in the UNED is more difficult than doing it face to face.
- The chances of meeting the set expectations and objectives indicate positive results as 48% of the students of the subjects Theoretical Paradigm and Project Management and Crisis Management affirm that it does fulfil them, 44% say that it fulfils all and 8% think that it does not do it, although they are taking the Master for other reasons (Figure 2). 75% of the students in the subject Budget and Governance in the EU state that it meets the most important ones, but there are some still missing, and 25% think that it meets all of them.

In conclusion, according to the results, the starting hypothesis is confirmed as with the application of the questionnaire about students' motivation essential information to improve recruitment, support and

---

<sup>6</sup> We must take into account that some practicing lawyers, engineers, judges, prosecutors and, in general, professionals from the business field who are also tutors in the UNED can become an endless source of information to know the real needs in the business world and help this way to improve the Master students' employability once they have finished or even create a network of contacts of great value to help graduates to enter the labour market.



monitoring of postgraduate students is gathered. The information given by these students can contribute to create a better structure of the organization of the Master, to recycle it and to design it according to their comments (central hypothesis). Also, the information gathered from their opinions and statements about their initial expectations and the fact that despite everything they will continue with their postgraduate studies favorably influences students satisfaction during the learning process and the experience and knowledge acquired (final hypothesis).

## 7. References

- Janzen, I. (1988). *Attitudes, Personality and Behavior*. Chicago: The Dorsey Press.
- Arambewella, R. & y Hall, J. (2008). "A model of student satisfaction: International postgraduate students from Asia". *European Advances in Consumer Reseach*, 8, 129-135.
- Bassat, L. (2006). *El libro rojo de las marcas. Cómo construir marcas de éxito*. Madrid: Espasa Calpe.
- Bedia García, I. (28 de noviembre de 2012). *El marketing de nicho: Segmentar para triunfar en tu negocio* <https://www.todostartups.com/bloggers/el-marketing-de-nicho-segmentar-para-triunfar-en-tu-negocio-por-ivanbedia> (consultada el 9 de septiembre de 2019).
- Buxarrais, M.R. y Escudero, A. (2014). Diagnóstico de valores a estudiantes de la Universidad de Barcelona a través del Inventario de Valores Hall-Tonna. *Revista Postconvencionales*, 7-8, 126-147.
- Donaldson, B. & McNicholas, C. (2004). "Understanding the postgraduate education market for UK-based study". *International Journal of Nonprofit and Voluntary Sector Marketing*, 9(4), 346-360.
- Felton, S., Buhr, N. & Northey, M. (1994). "Factors influencing the business student's choice of a career in chartered accountancy". *Issues in Accounting Education*, 9 (1), 131-141.
- Figuera, P., Raitz, T. y Llanes, J. (2012). "Os sentidos da formação acadêmia e do Trabalho para estudantes de mestrados no Brasil e na Espanha". *ETD: Educação Temática Digital*, 15 (3), 612-613.
- Figuera, P., Llanes, J., Buxarrais, M.R., Venceslao, M. (2018). "Perfil, motivación y satisfacción académica en los estudiantes de Máster: el caso de las Ciencias Sociales Jurídicas". *Estudios sobre Educación*. Vol. 34, 219-237.
- Fischer, S. y Dornbusch (1985). *Economía*. Madrid: Mc. Graw-Hill.
- González Rabanal. M.C. y Martínez Quintana, M.V. (2018). "Diseño de un cuestionario para mejorar la captación, el apoyo y seguimiento de los alumnos de Másteres oficiales, evaluando su motivación", *X Jornadas de Investigación en Innovación Docente de la UNED. Innovación educativa en la era digital. 28-29 de noviembre de 2018*. UNED, Madrid.
- González Rabanal. M.C. y Martínez Quintana, M.V. (2019). "Aproximación al conocimiento de la motivación de los alumnos de Máster en la UNED. Tres experiencias recientes". *XXIV Congreso Internacional de Tecnologías para la Educación y el Conocimiento*, 25-28 de junio, UNED, Madrid.
- Gatfield, T., Barker, M. & Graham, P. (1999). "Measuring student quality variables and the implications for management practices in higher education institutions: an Australian and international student perspective". *Journal of Higher Education Policy and Management*, 21(2), 239-252.

Hall, B.P. y Elexpuru, I. (2001). "Valores y organizaciones que aprenden". *Organizacion y gestión educativa*, 3, 18-23.

Hernández, C. A., Jiménez, M., Guadarrama, E. y Rivera, Á. E. (2016). "La Percepción de la Motivación y Satisfacción de la Tutoría Recibida en Estudios de Postgrado". *Formación Universitaria*, vol. 9, nº 2, 2016, 49-58.

Kawasaki, G. (2011). *El arte de cautivar: guía para sobresalir, influir y triunfar*. Barcelona: Gestión S.A Ediciones 2000.

Kotler, Ph. et al. (2017). *Marketing 4.0. Moving from Traditional to Digital*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Kotler, Ph. y Keller, K.L. (2012). *Dirección de Marketing* (14ª edición). México: Pearson Educación.

Lipsey, R.G. (1989). *Introducción a la Economía Positiva*. Madrid: Mc. Graw-Hill.

Mai, L. (2005). "A comparative study between UK and US: The student satisfaction in higher education and its influential factors". *Journal of Marketing Management*, 21, 859-878.

Quentin, J. (2000). "A quality education is not customer driven". *Journal of Education for Business*, 75(5), 298-300.

Sánchez Herreras, J., Pintado Blanco, T., Talledo Flores, H. Y Carcelén Garcia, S. (2009). "La educación de Postgrado en España. Un estudio empírico de la estructura de motivaciones latentes". *Innovar. Revista de Ciencias Sociales*, vol. 19, pp. 131-140. Bogotá: Universidad Nacional de Colombia.

Tan, L.M. & Laswad, F. (2006). "Students' Beliefs, attitudes and intentions to major in accounting". *Accounting Education: an International Journal*, 15 (2), 167-187.

Tapia, J.A., Montero, I. y Huertas, J.A. (2000). *Evaluación de la motivación en sujetos adultos: el cuestionario MAPE-3*. Available at: [http://sohs.pbs.uam.es/webjesus/eval\\_psicologica/cuestionarios/mape3.pdf](http://sohs.pbs.uam.es/webjesus/eval_psicologica/cuestionarios/mape3.pdf).

Thompson, E.R. & Gui, Q. (2000). "Hong Kong executive business students' motivations for pursuing an MBA". *Journal of Education for Business*, 75 (5), 236-240.

Tinto, V. (2015). "Though the Eyes of Students. Journal of College Student Retention: Research". *Theory & Practice*, 193(3), 254-269.

West, J., Newell, S. & Titus, P. 2001. "Comparing marketing and non-business students' choice of academic field of study". *Marketing Education Review*, 11(2), 75-82.

## Human-Computer Learning Interaction in a Virtual Laboratory

### Vasilis Zafeiropoulos

Hellenic Open University, Greece  
vasilizaf@eap.gr

### Dimitris Kalles

Hellenic Open University, Greece  
kalles@eap.gr

#### Abstract

Science universities face constantly the challenge of making the laboratory training of their students efficient as well as safe from damages and accidents. For this purpose, Hellenic Open University has developed a 3D game, Onlabs (<http://onlabs.eap.gr>), which simulates its on-site biology lab as a complementary means of lab training. In Onlabs, a student is allowed to interact with the various virtual instruments and perform a variety of virtual experiments. Moreover, performance can be evaluated with a scoring mechanism. The evaluation is done according to the actions made by the student in order to carry out an experiment as well as the order those actions were made. Obviously, actions are of varying importance, so we use numeric weights to represent those degrees of importance, and according to them, we calculate the final score. However, as weights are defined arbitrarily, we develop a human-computer learning interaction module using a genetic algorithm to automatically fine tune these weights. We introduce a training mode, where the computer plays on its own and chooses randomly between the various actions; every time a play session ends, a human expert provides our genetic algorithm with a final score estimate as feedback, and based on those feedbacks, the weights are calibrated into more accurate values.

**Keywords:** genetic algorithms, machine learning, virtual laboratory, virtual worlds, non-playable characters

#### 1. Introduction

Onlabs is an interactive virtual lab used for the distance laboratory education of undergraduate and post-graduate biology students of Hellenic Open University. Students are being handed with its latest version every year and are expected to use it at home before they use the on-site laboratory.

Onlabs resembles a modern computer game; it contains state-of-the-art 3D graphics while the user interacts with it through the keyboard and the mouse and has tasks and missions to follow.

##### 1.1 Purpose and Development of the Virtual Lab

One of the most delicate tasks that science universities are confronted with is the teaching of their students in using the laboratory equipment and successfully carrying out experiments. Serious risks lurk when making use of an on-site laboratory, such as those of accidents and equipment damages, restricting therefore the full use of the various instruments as well as the possibility of learning by trial-and-error. Distance universities offering science education, particularly, face another problem, too, that of not having their students at a regular basis (or at all) at their laboratory facilities, making their lab training even harder.

For all those reasons, Hellenic Open University (HOU), offering distance education, among others, in Natural Sciences, has been developing Onlabs, a 3D virtual biology laboratory for the lab training of its undergraduate and postgraduate science students. Unlike on-site lab training, in Onlabs, students can

fearlessly experiment with the lab instruments and equipment in virtually unlimited ways, even making improper use of some of them, and learn by their own mistakes. Nevertheless, by no means does virtual experimentation in Onlabs substitute the on-site lab training; instead, it complements it.

In Onlabs, the user interacts with the environment in a similar way to that of an adventure game; that is, they navigate with the arrow keys and they press buttons, turn knobs, combine specific objects etc. with the mouse.

Between 2012-2016, Onlabs was developed with Hive3D<sup>1</sup> while from 2016 until today it's been being developed with Unity, both of them being high-end 3D game engines. Several versions of Onlabs have been released up to now, the latest one being version 2.1, released in June 2017 (Figure 1). Currently, we have been developing version 3 which is expected to be released in 2019.



Figure 1: A screenshot of Onlabs (version 2.1).

### 2.1 Different Playing Modes

Onlabs version 2.1 includes the simulation of two separate experiments, those of the microscoping of a test specimen and the preparation of 500ml of 10X TBE water solution. The first procedure involves the setting of the photonic microscope and the creation of a test specimen as well as its microscoping with the microscope's objective lenses, while the second one involves the weighting of boric acid and trizma base powders and their dissolution in water with the magnetic stirrer along with the addition of EDTA pH 8.0 and water to the produced solution. It also includes three different modes of playing, those of *instruction*, where the human user is guided by voice and text and is allowed to perform only the suggested move each time; *evaluation*, where the human user is free to make any move they want with respect to the selected experiment while being evaluated on their performance; and *experimentation*, where the human user is free to make any permitted action they want with all equipment available from both simulated procedures and without receiving any evaluation. One can download and try version 2.1 of Onlabs from the project's website<sup>2</sup>.

Onlabs version 3.0, which is under development, concerns the exact same experimental procedure of microscoping of a test specimen as in version 2.1 as well as the procedure of electrophoresis, first part of

---

<sup>1</sup> Released by Eyelead, a computer game company based in Athens, Greece.

<sup>2</sup> <http://onlabs.eap.gr/>

which is the preparation of 500ml of 10X TBE that exists in version 2.1. Onlabs version 3.0 also includes a new playing mode, that of *training*. Under that, not a human user but an NPC, that is, a Non-Playable Character, plays on its own and performs random actions within the selected experimental procedure; upon the end of each playing session, a human expert in biology assesses the NPC's performance with a particular score for 0 to 100. This score is then used as feedback in the machine learning algorithms which are incorporated in Onlabs and used for the training of the NPC. Finally, the outcome of the NPC's training is to be used for the adjustment of the assessment mechanism for the human user's performance in Onlabs's evaluation mode mentioned above.

The machine learning techniques we have so far designed and are presenting in this paper is an interactive genetic algorithm, that is, a genetic algorithm adjusted to supervised learning.

### 3.1 Evaluation

Onlabs's first version 0.1 was evaluated by undergraduate biology students at HOU with the System Usability Questionnaire (SUS) for systems engineering, developed by John Brooke of Digital Equipment Corporation in Great Britain, in 1996 (Brooke, 1996). The feedback received was encouraging; Onlabs was evaluated as easy to use while the students who used it improved their performance in the physical lab afterwards (Zafeiropoulos, Kalles, & Sgourou, 2016; Zafeiropoulos, Kalles, Sgourou, & Kameas, 2014). Versions 0.2, 0.2.1 and 0.2.3 were also evaluated, this time by other universities' undergraduate students as well as high school teachers in various disciplines of science, making use of the same, yet now adjusted, questionnaire. The evaluation results were analogous to the ones of version 0.1's evaluation.

For Onlabs's latest version 2.1, a more solid evaluation was done. Particularly, two educational methods with respect to the previously mentioned microscoping of a test specimen procedure were used and compared to each other, those of the routine on-site lab tutorial method and a proposed educational scenario of using Onlabs with a Skype session running at the same time. The learning results by various students were assessed with the use of Pre and Post-Tests. The Pre-Tests scores indicated that Onlabs experience provided the test subjects with higher baseline knowledge while the Post-Tests scores indicated that students who used Onlabs outperformed those who hadn't used it (Paxinou, Karatrantou, Kalles, Panagiotakopoulos, & Sgourou, 2018; Paxinou, Zafeiropoulos, Sypsas, Kiourt, & Kalles, 2017).

## 2. Background & Related Work

Genetic algorithms simulate biological evolution. In nature, organisms consist of *cells*, each one of which has the same set of one or more *chromosomes*. A chromosome of an organism contains all the "specifications" of the latter which define its biology. Chromosomes in turn consist of *genes* which are rather a concept than actual chromosome divisions. In rough, a gene controls a characteristic of the organism, like eye or hair color. Generally, biological evolution is the result of chromosomes competing against each other and the "fittest" ones among them being selected for reproduction, giving birth to new offspring containing genes from both of their parent chromosomes, a process known as *crossover*. At the same time, the process of *gene mutation* plays an important role, too, with the mutated genes appearing randomly among the new offspring. Similarly, genetic algorithms deal with crossover, that is, the competition of candidate solutions against each other and the selection of a percent of them to reproduce while a mutation is also performed on some of the offspring (M. Mitchell, 1996).

Evolutionary computing was first introduced by Fogel, Owens and Walsh (1966), as a method of choosing the fittest among several mutated finite state machines. Genetic algorithms were initially developed by John

Holland in 1975, as a solid theoretical framework of applying the operations of crossover, mutation and inversion on a large population of candidate solutions (Holland, 1992).

Genetic algorithms have broad applications in various fields, such as game theory (Marks, 2002), scheduling (Wall, 1996) and power electronics design (Busquets-Monge, Hertz, Soremekun, Boroyevich, & Gurdal, 2001). They are also present in computer games, for the adjustment of the behavior of the Non-Playable Characters (Arora, 2019; Charles, Fyfe, Livingstone, & McGlinchey, 2008; Martin, 2011; Mendona, Pozzer, & Raittz, 2008).

Since the conception of genetic algorithms by Holland, many variations of them have existed. One of them includes the separate operation of *selection*, which consists of selecting a percent of candidate solutions by their fitness and "copying" them into the next generation (T. M. Mitchell, 1997). The genetic algorithm we have designed for our virtual lab abides by that particular design.

As genetic algorithms resemble biological evolution, they usually don't accommodate supervised learning. However, there is a branch of genetic algorithms, namely interactive genetic algorithms, which make use of some human guidance and have been extensively used in various studies (Dunwei Gong, Jie Yuan, & Xiaoping Ma, 2008; Spears & De Jong, 1990; Sun, Gong, & Zhang, 2012; Sun, Ren, & Gong, 2010). Our genetic algorithm falls into that category.

Being an adventure game, Onlabs is a suitable test-bed for the training of artificial agents, as that particular category of computer games has been proposed for (Amir & Doyle, 2002; Hlubocky & Amir, 2004). Several machine learning applications have been developed within the framework of an adventure game. Such is the application of *Sophie's Kitchen*, developed by Andrea Thomaz and Cynthia Breazeal (2006, 2008). In this, Sophie, a robot-like Non-Playable Character agent tries to prepare a cake by using the appropriate ingredients together and baking it in the oven; in each training session, the expert gives Sophie several feedbacks upon which Sophie learns how to properly make a cake with reinforcement learning.

In the recent years, adventure games and particularly the text-based ones, have re-emerged as platforms for machine learning. In those, several techniques have been used for the training of NPCs, such as deep reinforcement learning (Ammanabrolu & Riedl, 2019; Narasimhan, Kulkarni, & Barzilay, 2015) and neural networks (Kostka, Kwiecien, Kowalski, & Rychlikowski, 2017; Robitzski, 2019).

### **3. Training a Non-Playable Character in the Virtual Lab**

As mentioned in the introduction, machine learning is used in Onlabs version 3.0 for the purpose of training a NPC in correctly carrying out a particular experimental procedure, that of microscoping of a test specimen or electrophoresis. Furthermore, the outcome of NPC training under training mode of Onlabs is going to be used for the calibration of the embedded scoring mechanism for the assessment of human user's performance under evaluation mode.

The successful performance of an experimental procedure depends on two factors; whether the appropriate actions were made and whether they were also made in the correct order. Those two factors are incorporated as two separate metrics in the scoring mechanism for the human user's performance in evaluation mode for versions 2.1 and 3.0, *success rate* and *penalty points* respectively, and in order for the *aggregate score* to be calculated, those two metrics are taken into account.

When an NPC is being trained in Onlabs's training mode, the same scoring mechanism is used to "secretly" evaluate the NPC's performance, along with the latter being "openly" evaluated by the human expert at the



end of the session. Specifically, the production of the *success rate* (resp. the *penalty points*) based on Onlabs's scoring mechanism is done while another estimation of the *success rate* (resp. the *penalty points*) is given by the human expert. Those two different *success rates* (resp. *sums of penalty points*) are combined within our machine learning algorithms for the purpose of training our NPC.

Considering the *success rate* metric, which deals with the steps to be made, we have been working with two different machine learning techniques; an interactive genetic algorithm and a neural network. Considering the penalty points metric which deals with the order of the necessary steps to be made, we are planning to use reinforcement learning as it seems the most suitable for it.

In this paper, we are presenting the interactive genetic algorithm we have designed for the *progress rate* metric through the procedure of microscoping of a test specimen. Before going any deeper though, we need to make a brief mention of the conceptual design and the scoring mechanism of Onlabs, upon which the genetic algorithm is based.

#### 4.1 Conceptual Design

Onlabs's virtual environment is discrete; that is, the objects in it are perceived as separate from one another and can be manipulated by an agent only through a finite set of actions. Moreover, the environment is deterministic; that is, when a specific action is performed, the produced new state of the environment is uniquely (in other words, non-stochastically) determined by the action and the environment's previous state (Russell & Norvig, 2003).

In Onlabs virtual environment lie several different *entities*. Those entities can either be *characters* or "inanimate" *objects*. For the moment, the only existing character in Onlabs is the *human agent*, namely the Ego Character, controlled by the user through the application's interface. In terms of both design and development, entities are handled by classes. A *class* is an abstract representation of one or more kindred entities; for example, all bottles in Onlabs (wash bottle, EDTA bottle) are *instances* of the *bottle* class. Furthermore, a class may be a specialization of a base class, or in programming terms, inherit from it; for example, the *bottle* class inherits from the *vessel* one, meaning that bottles share vessels' basic traits as well as having their own particular ones. For the sake of simplicity, we'll be referring to the various entities with their class names, unless we deal with two or more of a kind, so, in that case, we'll be using the names of the respective instances.

Most inanimate entities in Onlabs have specific actions that can be performed on them by the user. Such actions are *Pick Up* (collecting an object to the inventory), *Press* (valid for buttons, switches and triggers), *Rotate* (valid for knobs) and *Use With* (combining with another object).

Each class has several *features*. Those can be qualitative (alphanumeric) or quantitative (numeric), depending on the *values* they can take; for example, the *state* feature of microscope's *AC switch* class is qualitative, taking the values of 'ON' and 'OFF', while the *position* feature of *aperture knob* class is quantitative, taking integer values from 0 to 40. The human user can alter those feature values directly, by performing various actions on the respective entities, or indirectly, by performing actions on other entities which get their features' values altered and those value changes cause in turn the values of the desired features of the entities on focus to change, too. For example, pressing the microscope's *AC switch* changes the latter's *state* feature from 'ON' to 'OFF' while using the microscope's *plug* with the *socket* changes the *microscope* entity's *connection status* feature from "disconnected" to "connected to socket". State-Transition When applicable,



state-transition diagrams are used for the depiction of the value changes that take place in Onlabs (Yourdon, 1989). For the last two examples, the diagrams are shown in Figures 2 and 3, respectively.

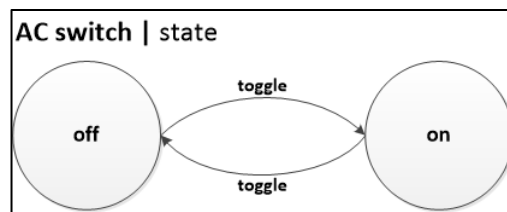


Figure 2: State Transition Diagram of *AC switch's state* feature

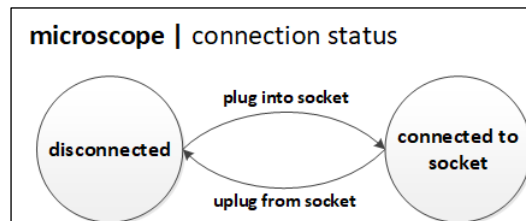


Figure 3: State Transition Diagram of *microscope's connection status* feature

Our previous publications about Onlabs's conceptual modelling and its development process [2][3] are available on Onlabs's website.

### 5.1 Assessment Mechanism

As mentioned in the beginning of this section, Onlabs's scoring takes two metrics into consideration; the *success rate*, reflecting the steps that the user has made for the completion of a particular experiment and the *penalty points*, reflecting the order that those steps have been performed.

The necessary steps for the successful completion of the microscoping procedure are those listed in Table 1.

**Table 1.** Steps necessary for the successful completion of microscoping procedure.

1	Connect the microscope into the socket <i>microscope   connection status</i> ← 'connected to socket'
2	Turn the microscope light on <i>AC switch   state</i> ← 'ON'
3	Set light intensity to 2 3rds of maximum <i>light intensity knob   position</i> ← $\frac{2}{3} \cdot \text{MaxPosition}$
4	Set iris fully open <i>aperture knob   position</i> ← MaxPosition
5	Lift the condenser lens to the top position <i>condenser   height</i> ← MaxHeight
6	Set lens 4X active <i>revolving nosepiece   active focus</i> ← 4
7	Put test specimen on stage

	<i>stage</i>   <i>attached specimen</i> ← 'yes'
8	Enter microscope mode <i>Ego</i>   <i>mode</i> ← 'microscoping'
9	Focus with lens 4X <i>Microscoping view</i>   <i>clearness</i> [ <i>revolving nosepiece</i>   <i>active focus</i> = 4] ← 1
10	Focus with lens 10X <i>Microscoping view</i>   <i>clearness</i> [ <i>revolving nosepiece</i>   <i>active focus</i> = 10] ← 1
11	Focus with lens 40X <i>Microscoping view</i>   <i>clearness</i> [ <i>revolving nosepiece</i>   <i>active focus</i> = 40] ← 1
12	Focus with lens 100X <i>Microscoping view</i>   <i>clearness</i> [ <i>revolving nosepiece</i>   <i>active focus</i> = 100] ← 1

One sees from Table 2 which particular value assignment takes place at each step. Some of those values are alphanumeric while the majority of them are numeric. We start by calculating the *individual scores* for the various values; then we proceed into the overall scoring assessment.

For the calculation of the individual scores to be made, two separate processes must first take place: the *quantification* of the alphanumeric values and the *normalization* of the numeric ones.

### Quantization

The first assignment in Table 2 consists of the *microscope's connection status* feature taking the value of 'connected to socket'. Here are only two states, 'disconnected' and 'connected to socket'. The quantification to be done here is rather obvious: the former is converted to 0 and the latter to 1.

The same quantification is applied for the next value assignment at Step 2, as *AC switch's state* feature also gets only two values, 'OFF' and 'ON', so 'OFF' becomes 0 and 'ON' becomes 1. Likewise, the quantification of the value of *stage's attached specimen* feature is 0 when it's null and 1 when it points at a test specimen.

Similar are the quantifications for the alphanumeric values of other changeable features.

### Normalization

All the afore-mentioned values, when quantified, were at the same time normalized; that is, they range in [0,1] (in fact, 0 and 1 are the only acceptable values within this interval). In other words, considering the features in question (*microscope's connection status*, *AC switch's state* and *stage's attached specimen*), their quantified *initial* values are 0 while their *optimal* ones are 1.

Let's now see how the normalization is possible in a case of a numerical value not ranging between 0 and 1, by focusing on the example of the *position* feature of the *aperture knob* of the microscope which configures the opening of the microscope's iris and the light getting through it. Its value ranges from 0 (the initial value, where the iris is closed) to 40 (the optimal value, where the iris is fully open). What we therefore need is a *normalization function* which would particularly return 0 when *position's* value is 0 and 1 when *position's* value is 40. Such function is the following:

$$f(x) = \frac{1+a}{1+c \cdot (x-40)^2} - a$$

where  $a=0.104$  and  $c=0.006$ .

The graph of  $f(x)$  is depicted in Figure 2.

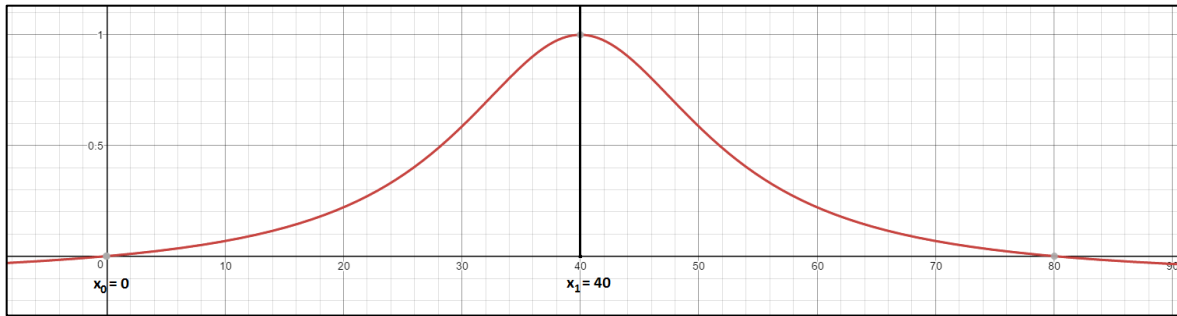


Figure 4. The graph of  $f(x) = \frac{1+a}{1+c \cdot (x-40)^2} - a$  for the normalization of *aperture knob's position* ( $a=0.104$ ,  $c=0.006$ ).

Similar are the normalizations for the numeric values of other changeable features.

### Success Rate

Having specified the various individual scores, it's time to proceed in the definition of their combined score, namely the *success rate*.

The *success rate* is defined as the weighted average percentage of all individual scores:

$$success\ rate \leftarrow \frac{\sum_{i=1}^n w_i \cdot score_i}{\sum_{i=1}^n w_i} \quad (4)$$

where  $n$  is the number of steps required for the completion of the procedure (12 in our microscoping procedure), and  $w_i$  the predefined weight of the  $i$ -indexed individual score. As the individual scores cannot exceed the value of 1, it is guaranteed that neither can the *success rate* be greater than 1. Nevertheless, the user is provided with a re-scaled *success rate* in the 0-100 range, for user-friendliness purposes.

### Penalty Points

In practice, the *success rate* measures the "distance" of the various features' values from their optimal values, that is, the values taken when the procedure in question has been successfully completed. What it doesn't measure though is the *order* in which those optimal values were achieved; in other words, in which order the necessary steps were made. That is made possible with the use of the *penalty points* metric. In brief, *penalty points* increase in value whenever an action is made in the wrong order. The description of the respective algorithm, however, is beyond the scope of this paper.

### Aggregate Score

Last comes the *aggregate score*, which is no other than the *success rate* weighted by the *penalty points*:

$$aggregate\ score \leftarrow e^{-\frac{penalty\ points}{1000}} \cdot success\ rate$$

From the formula above, one sees that *aggregate score*, exactly like *success rate*, can't exceed 1. Like *success rate*, *aggregate score* is given to the user as a percentage.

### 6.1 Learning the Weights using Genetic Algorithms

As mentioned before, the machine learning technique for the NPC's training that we are presenting in this paper is an interactive genetic algorithm. Most often, genetic algorithms are unsupervised; the various survivors are selected according to a fixed parameter fitness function. In our case though, the fitness function is based on the assessment of the NPC's performance as produced by the human expert.

#### Interactive Genetic Algorithm

Our genetic algorithm attempts to learn the weights in the scoring algorithm,  $w_1, w_2, \dots, w_n$ , where each weight reflects the relative importance on the overall respective score for each feature taken into consideration. We set *weight vector*  $w$  to be:

$$\vec{w} = (w_1, w_2, \dots, w_n)^T \quad (1)$$

Initially, we have a population of  $p$  random weight vectors,  $\vec{w}^1, \vec{w}^2, \dots, \vec{w}^p$ , or, in general form,  $\vec{w}^i$ , where  $i = 1 \dots p$ . Adjusting (1), we have:

$$\vec{w} = (w_1^i, w_2^i, \dots, w_n^i)^T \quad (2)$$

The initial population (the first generation) of weight vectors can be produced in various ways. We choose to define  $\vec{w}^1$  intuitively and produce the rest of weight vectors  $\vec{w}^2, \dots, \vec{w}^p$  by performing several mutations on the former.

Next comes a *fitness function*, according to which some particular weight vectors will either survive unchanged or spread their "genes" (scalar weight components  $w_k^i$ ) through crossover in the next generation. The *fitness function* must somehow "embed" the accuracy of a *weight vector* in the process of the *success rate* calculation of the scoring algorithm.

By playing a session in the training mode, the NPC receives some *score* for each relevant feature whose state was altered. We already know that the *score* for each composing feature gets values within the range [0,1] and that the overall success rate is the weighted average of those values:

$$success\ rate \leftarrow \frac{\sum_{k=1}^n w_k^i \cdot score_k}{\sum_{k=1}^n w_k^i} \quad (3)$$

Thus, the *fitness function* must take into account the effect the weights have on the success rate, which in turn depends on the *score* values.

We construct the *score vector* in a similar fashion to the *weight vector* defined above (scores are indicated by  $s$ ):

$$\vec{s} = (s_1, s_2, \dots, s_n)^T \quad (4)$$

Let us for start assume we have only one *score vector*,  $\vec{s}$ , and that its *expert success rate*,  $esr(\vec{s})$ , is the success rate provided externally by a human expert (as the expert provides a values from 0 to 100, we re-scale it in the 0-1 range). Our goal is to find a *weight vector* that, for a particular *score vector*  $\vec{s}$ , is capable of

producing a score which is as close to the *expert success rate*  $esr(\vec{s})$  as possible. To do that, we define a *fitness function* of weight vector  $\vec{w}^i$  in association with score vector  $\vec{s}$ .

The typical *success rate* of score vector  $\vec{s}$  is produced by  $\vec{w}^i$  is  $\frac{\sum_{k=1}^n w_k^i \cdot score_k}{\sum_{k=1}^n w_k^i}$ , or in vector terms,  $\frac{\vec{w}^i \cdot \vec{s}}{\|\vec{w}^i\|_1}$ , where  $\|\vec{w}^i\|_1$  is the first degree norm of  $\vec{w}^i$  vector, that is,  $w_1^i + w_2^i + \dots + w_n^i$ , or  $\sum_{k=1}^n w_k^i$ .

We define *fitness function* as:

$$Fitness_{generic}(\vec{w}^i) = 1 - \left| esr(\vec{s}) - \frac{\vec{w}^i \cdot \vec{s}}{\|\vec{w}^i\|_1} \right| \quad (5)$$

The function above is maximized to 1 when the produced score is equal to the expert's score whereas it is minimized when those two scores are as distant as possible from each other.

However, one *score vector* is not enough for our *fitness function* to be accurate. Thus, we choose several *score vectors*,  $\vec{s}^j$ , where  $j = 1 \dots l$ , and their respective *expert success rates*,  $esr(\vec{s}^j)$ , to be used for our calculations. Then we specialize the afore-mentioned *generic fitness function* for each *score vector*  $\vec{s}^j$  as:

$$Fitness_j(\vec{w}^i) = 1 - \left| esr(\vec{s}^j) - \frac{\vec{w}^i \cdot \vec{s}^j}{\|\vec{w}^i\|_1} \right| \quad (6)$$

And finally, we define our overall *fitness function* of  $\vec{w}^i$  as the average of the various *fitness functions* in (6), that is:

$$Fitness(\vec{w}^i) = \frac{\sum_{j=1}^l Fitness_j(\vec{w}^i)}{l} = \frac{\sum_{j=1}^l \left[ 1 - \left| esr(\vec{s}^j) - \frac{\vec{w}^i \cdot \vec{s}^j}{\|\vec{w}^i\|_1} \right| \right]}{l} = \frac{l - \sum_{j=1}^l \left| esr(\vec{s}^j) - \frac{\vec{w}^i \cdot \vec{s}^j}{\|\vec{w}^i\|_1} \right|}{l} \text{ or:}$$

$$Fitness(\vec{w}^i) = 1 - \frac{\sum_{j=1}^l \left| esr(\vec{s}^j) - \frac{\vec{w}^i \cdot \vec{s}^j}{\|\vec{w}^i\|_1} \right|}{l} \quad (7)$$

where  $l$  is the number of the different *score vectors* taken into consideration.

The new generation of weight vectors will have the same number of members,  $p$ . Some of those members of the new generation will be identical to some of the current generation while the rest of them will be produced by crossover operation on some members of the latter.

Assuming  $r$  is the fraction of the current generation of weights to be replaced, we select  $(1 - r) \cdot p$  elements of them to directly add them to the new generation using *fitness proportionate selection* [12]:

$$Pr(\vec{w}^i) = \frac{Fitness(\vec{w}^i)}{\sum_{k=1}^p Fitness(\vec{w}^k)} \quad (8)$$

We then select  $\frac{r \cdot p}{2}$  weight vectors from the current generation, regardless of having been chosen before, according to the *fitness proportionate selection* given above.

Finally, assuming  $m$  is the mutation rate, we select  $m$  percent of the population of the current generation to be mutated. The selection in this step is done with uniform probability.

This second generation of weight vectors that has been produced is then used with the exact same score vectors (that is, the same playing outcomes) and the same expert's success rate (that is, the same evaluation by the human expert for each respective playing outcome) that the first generation was used with; afterwards, it is undergone the same operations of selection, crossover and mutation producing the third generation and so on.

We finally need to specify a termination condition for our genetic algorithm. We therefore set the latter to halt when the maximum of  $\{Fitness(\overline{w}^i), 1 \leq i \leq p\}$  at a generation becomes greater than a threshold (e.g. 0.95). However, if a particular limit of generations is reached without any of the weight vectors of the last generation satisfying the termination condition, the algorithm needs to be restarted or the threshold to be reduced.

### **Implementation of Genetic Algorithm**

Our genetic algorithm has been fully defined as described above. In brief, an Non-Playable Character which plays various sessions in microscoping procedure under the training mode, a human expert evaluates its performance in each one of the sessions and using those data, our interactive genetic algorithm produces an optimal weight vector which is to be embedded in the evaluation mode and used for the assessment of the human user's performance.

We are now in the process of implementing the algorithm programmably and collecting data for it.

## **4. Conclusions**

Onlabs is an interactive 3D virtual laboratory for complementing the training of science students in biology wet laboratories. A student may use Onlabs in evaluation mode and be assessed for their performance within a particular experimental procedure by the software's embedded scoring mechanism. However, the scoring mechanism is originally based on intuitive values defined by experts and the motivation is to fine tune these values into more realistic ones. To do that we will deploy an Non-Playable Character for carrying out experiments in Onlabs and we will train it with the help of an expert who assigns a final score. Using a genetic algorithm will subsequently allow us to search automatically for weights to fit the expert's scoring approach. The implementation of the genetic algorithm and the data collection are both ongoing work.

Our future plan is to enrich our machine learning techniques for the training of the NPC by introducing neural networks and reinforcement learning, too. Moreover, we are planning to combine some of those techniques (e.g. use neural networks to re-adjust the outcome produced by the genetic algorithm), or compare their various results for a range of parameter values.

## **5. Acknowledgements**

This research has been co-financed by the Operational Program "Human Resources Development, Education and Lifelong Learning" and is co-financed by the European Union (European Social Fund) and Greek national funds.

## **6. References**

- Amir, E., & Doyle, P. (2002). Adventure Games: A Challenge for Cognitive Robotics. *American Association of Artificial Intelligence (Www.Aaai.Org)*, 8.
- Ammanabrolu, P., & Riedl, M. (2019). Playing Text-Adventure Games with Graph-Based Deep Reinforcement Learning. *Proceedings of the 2019 Conference of the North American Chapter of the*

*Association for Computational Linguistics: Human Language Technologies, Volume 1 (Long and Short Papers)*, 3557–3565. <https://doi.org/10/gf9fzz>

Arora, A. (2019, February 4). Using Genetic Algorithms to Automate the Chrome Dinosaur Game (Part 2). Retrieved September 26, 2019, from Medium website: <https://heartbeat.fritz.ai/using-genetic-algorithms-to-automate-the-chrome-dinosaur-game-part-2-1c0007334297>

Brooke, J. (1996). SUS - A Quick and Dirty Usability Scale. In P. W. Jordan, B. Thomas, I. L. McClelland, & B. A. Weerdmeester (Eds.), *Usability Evaluation in Industry* (p. 7). London: Taylor & Francis.

Busquets-Monge, S., Hertz, E., Soremekun, G., Boroyevich, D., & Gürdal, Z. (2001). *Design Optimization of Power Electronics Circuits using Genetic Algorithms-A Boost PFC Converter Example*.

Charles, D., Fyfe, C., Livingstone, D., & McGlinchey, S. (Eds.). (2008). *Biologically Inspired Artificial Intelligence for Computer Games*. <https://doi.org/10.4018/978-1-59140-646-4>

Dunwei Gong, Jie Yuan, & Xiaoping Ma. (2008). Interactive Genetic Algorithms with Large Population Size. *2008 IEEE Congress on Evolutionary Computation (IEEE World Congress on Computational Intelligence)*, 1678–1685. <https://doi.org/10/fg8fhh>

Fogel, L. J., Owens, A. J., & Walsh, M. J. (1966). *Artificial Intelligence through Simulated Evolution*. Oxford, England: John Wiley & Sons.

Hlubocky, B., & Amir, E. (2004). *Knowledge-Gathering Agents in Adventure Games*.

Holland, J. H. (1992). *Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control and Artificial Intelligence*. Cambridge, MA, USA: MIT Press.

Kostka, B., Kwiecien, J., Kowalski, J., & Rychlikowski, P. (2017). Text-Based Adventures of the Golovin AI Agent. *2017 IEEE Conference on Computational Intelligence and Games (CIG)*, 181–188. <https://doi.org/10/gf9fz2>

Marks, R. E. (2002). Playing Games with Genetic Algorithms. In S.-H. Chen (Ed.), *Evolutionary Computation in Economics and Finance* (pp. 31–44). [https://doi.org/10.1007/978-3-7908-1784-3\\_2](https://doi.org/10.1007/978-3-7908-1784-3_2)

Martin, M. (2011, August 30). Using a Genetic Algorithm to Create Adaptive Enemy AI. Retrieved September 26, 2019, from Gamasutra—The Art & Business of Making Games website: [https://www.gamasutra.com/blogs/MichaelMartin/20110830/90109/Using\\_a\\_Genetic\\_Algorithm\\_to\\_Create\\_Adaptive\\_Enemy\\_AI.php](https://www.gamasutra.com/blogs/MichaelMartin/20110830/90109/Using_a_Genetic_Algorithm_to_Create_Adaptive_Enemy_AI.php)

Mendonça, V. G. de, Pozzer, C. T., & Raittz, R. T. (2008). *A Framework for Genetic Algorithms in Games*. 4.

Mitchell, M. (1996). *An Introduction to Genetic Algorithms*. Cambridge, Massachusetts: Massachusetts Institute of Technology.

Mitchell, T. M. (1997). *Machine Learning*. New York, NY, USA: McGraw-Hill, Inc.

Narasimhan, K., Kulkarni, T., & Barzilay, R. (2015). Language Understanding for Text-Based Games Using Deep Reinforcement Learning. *ArXiv:1506.08941 [Cs]*. Retrieved from <http://arxiv.org/abs/1506.08941>

Paxinou, E., Karatrantou, A., Kalles, D., Panagiotakopoulos, C., & Sgourou, A. (2018). A 3D Virtual Reality Laboratory as a Supplementary Educational Preparation Tool for a Biology Course. *European Journal of Open, Distance and E-Learning*, 21(2). Retrieved from <http://www.eurodl.org/?p=archives&sp=brief&year=2018&halfyear=2&article=777>

Paxinou, E., Zafeiropoulos, V., Sypsas, A., Kiourt, C., & Kalles, D. (2017). Assessing the Impact of Virtualizing Physical Labs. *ArXiv:1711.11502 [Cs]*. Retrieved from <http://arxiv.org/abs/1711.11502>

Robitzski, D. (2019, September 5). A Neural Network Dreams up This Text Adventure Game as You Play. Retrieved October 5, 2019, from Futurism website: <https://futurism.com/text-adventure-game-neural-network>

Russell, S., & Norvig, P. (2003). *Artificial Intelligence: A Modern Approach* (2nd ed.). Pearson Education.



- Spears, W. M., & De Jong, K. A. (1990). Using Genetic Algorithms for Supervised Concept Learning. [1990] *Proceedings of the 2nd International IEEE Conference on Tools for Artificial Intelligence*, 335–341. <https://doi.org/10/fkcp8g>
- Sun, X., Gong, D., & Zhang, W. (2012). Interactive Genetic Algorithms with Large Population and Semi-Supervised Learning. *Applied Soft Computing*, 12(9), 3004–3013. <https://doi.org/10/f34pf6>
- Sun, X., Ren, J., & Gong, D. (2010). Interval Fitness Interactive Genetic Algorithms with Variational Population Size Based on Semi-Supervised Learning. In L. Zhang, B.-L. Lu, & J. Kwok (Eds.), *Advances in Neural Networks—ISNN 2010* (pp. 288–295). Springer Berlin Heidelberg.
- Thomaz, A. L., & Breazeal, C. (2006). Reinforcement Learning with Human Teachers: Evidence of Feedback and Guidance with Implications for Learning Performance. *Proceedings of the 21st National Conference on Artificial Intelligence - Volume 1*, 1000–1005. Retrieved from <http://dl.acm.org/citation.cfm?id=1597538.1597696>
- Thomaz, A. L., & Breazeal, C. (2008). Teachable Robots: Understanding Human Teaching Behavior to Build More Effective Robot Learners. *Artificial Intelligence*, 172(6), 716–737. <https://doi.org/10/d49w2c>
- Wall, M. B. (1996). *A Genetic Algorithm for Resource-Constrained Scheduling* (PhD Thesis). Massachusetts Institute of Technology, Cambridge, MA, USA.
- Yourdon, E. (1989). *Modern Structured Analysis*. Upper Saddle River, NJ, USA: Yourdon Press.
- Zafeiropoulos, V., Kalles, D., & Sgourou, A. (2016). Learning by Playing: Development of an Interactive Biology Lab Simulation Platform for Educational Purposes. In *Experimental Multimedia Systems for Interactivity and Strategic Innovation* (pp. 204–221). Retrieved from <https://www.igi-global.com/chapter/learning-by-playing/135131>
- Zafeiropoulos, V., Kalles, D., Sgourou, A., & Kameas, A. (2014). Adventure-Style Serious Game for a Science Lab. In C. Rensing, S. de Freitas, T. Ley, & P. J. Muñoz-Merino (Eds.), *Open Learning and Teaching in Educational Communities* (pp. 538–541). Springer International Publishing.

## Immersive Telepresence: A framework for training and rehearsal in a post-digital age

**Tom Gorman**

School of Media and Performing Arts, Coventry University

aa4084@coventry.ac.uk

**Tiina Syrjä**

Degree Programme of Theatre Arts, Tampere University

tiina.syrja@tuni.fi

**Mikko Kanninen**

Degree Programme of Theatre Arts, Tampere University

mikko.kanninen@tuni.fi

### Abstract

This paper will examine how telepresence technologies are repurposed to enable student performers to rehearse and train over distances. The discussion will revolve around a variety of telepresence technologies/web-based applications repurposed to investigate actor training, rehearsal, education and performance. In the Immersive Telepresence in Theatre project, two identical spaces, linked by H.323 videoconferencing technology, were created in Tampere (Finland) and Coventry (UK), each with rear projection screens giving the participants the impression of a shared space. The project used existing pedagogical practices but re-applied them to a digital setting with the teaching and rehearsal process only slightly modified to account for the technological aspects of working in this manner. This project, which began in 2016 with Coriolanus Online, has since conducted further collaborations examining rehearsal and performance between Tampere, Coventry, Helsinki University of the Arts, Gothenburg Theatre Academy, Adam Mickiewicz University (Poznań) and Purdue University (USA).

As well as the examination of the traditional rehearsal process through these collaborations, there is also the social aspect which promotes teamwork and builds relationships between the student groups. A range of supporting applications were used to create digital 'social spaces' – Facebook for scheduling and rapid sharing of visual materials from rehearsals and web conferencing software, Adobe Connect, was used to provide contextual lectures, individualised rehearsal rooms for the participants and break-out spaces for the students to develop ideas and socialise away independently of the tutor led sessions.

**Keywords:** Telepresence, theatre, Shakespeare, arts education, latency, H.323, LoLa, Ultragrid, MVTP, immersion, virtual mobility, peer learning, rehearsal.

### 1. Introduction

Telepresence literally means technologically enabled presence but as a term it can take on many other meanings depending on the user and the usage. The term, first coined by Marvin Minsky in 1980 initially referred to the remote operation of tele-robots:

*'The biggest challenge to developing telepresence is achieving that sense of "being there." Can telepresence be a true substitute for the real thing? Will we be able to couple our artificial devices naturally and comfortably to work together with the sensory mechanisms of human organisms?'* (Minsky, 1980)

Brenda Laurel defined telepresence as *'a medium that allows you to take your body with you into another environment'* (Manovich 2002 p.153). Roy Ascott in 2003 expanded the definition to encompass the concept of a *"remote reconstruction of ourselves"* (Ascott 2003: 351) in a physical or virtual environment, whether synchronous (real-time) or asynchronous, and finally, Kris Paulsen recently refined these definitions:

*"The feeling of being present at a remote location by means of real-time telecommunications devices. One can be visually, aurally, and even tactilely present to distant, mediated environments through networked devices, such as video cameras and tele-robots."* (Paulsen, 2017)

Performing arts have always lagged behind other, more 'traditional' subjects when it has come to embracing online learning, especially in the case of telepresence technologies. The communal and physical nature of most theatre projects means that current online educational technologies struggle with the dynamics of the creative processes. Even those technologies designed for synchronous collaboration are not suitable for the peculiarities of performing arts education. Theatre making is, most typically, a group effort. It is usually synchronous - one group cannot rehearse independently and then share the work with the other<sup>1</sup>. With international collaboration in theatre both groups must rehearse and work together in the same space at the same time.

In any creative performance collaboration, the first task is to create a team dynamic. This group will become a company that will work together to explore and create a piece of theatre/dance or music. The physical rehearsal process usually begins with exercises and discussions between the participants to create a common sense of purpose. Performance and performer training require both intimacy and openness - the ability to simulate/recreate emotions and be comfortable with both physical and emotional intimacy in order to re-create this in a public performance situation. Trust is the key concept here as performers are often required to be emotionally vulnerable or at least technically adept and attuned to each other's performing rhythms. This is incredibly difficult to achieve online with two groups who have never actually met face to face and who now are working together through a technological interface, unable to touch.

Working online with performers is also limited in terms of image size and audio/video quality. Although consumer solutions such as Skype and Google Hangouts are perfectly adequate for conference calls and one-on-one communication, the lack of a full body view when using these technologies is problematic in the performing arts. Traditional video-conferencing solutions for business mostly utilise large, flat-screen televisions, mostly designed for meetings in which the participants are seated. Increasing the image size beyond the confines of the computer monitor can often increase pixilation of the image and, the larger the screen, the more visual degradation is to be expected. These solutions are also not designed for rapid movement and even high-end solutions such as Polycom (H.323) have smart focus technologies that can be confused by performers moving about a space rapidly causing further pixilation and a 'ghosting' effect<sup>2</sup>.

Musicians have led the way in this area, participating in online music practice since the early 1990's in order to save time and costs associated with travel and avoid the difficulties associated with transporting large instruments for international concerts and tuition. In November 1991, the

---

<sup>1</sup> Of course, there are exceptions to this and, at the more experimental end of telecollaboration in the performing arts, the limitations of pre-existing technologies have been built in to the collaborative process.

<sup>2</sup> Polycom have a smart focus system called 'Eagle Eye' built into their cameras. We found this means that the camera will mainly focus on the brightest object in the room (often whoever is wearing white). If the participant in white moves around quickly or if there are several individuals in white moving at the same time, the camera does not know which object to focus on. We have had to advise students to wear any colour other than white.

composer Pauline Oliveros celebrating 40 years of composing, used video telephone to connect performers in six cities across the US:

*Since the telephone line would grab the loudest signal the improvisation was based on sensitivity to give and take. Video was still image updated every 5 seconds. This latency had advantage for surprising changes in sequences of images. (Oliveros et al, 2009).*

In 1996 the Manhattan School of Music became the first US institution to pioneer online distance performance tuition inspired by Pinchas Zukerman who "was intrigued with video conferencing and how it could support our newly minted Zukerman Performance Program." (Orto, 2015)

Zukerman was fascinated by the potential of videoconferencing technologies and through Internet2<sup>3</sup> began to take classes with his students whilst on tour elsewhere in the US. These initial experiments involved Polycom, a system designed for business teleconferencing, but the system was not without its problems:

*"There's too much delay in the processing of the signal. Polycom has about 250 milliseconds of delay, or basically a quarter of a second. And then if you are going to connect between New York and, say, Los Angeles, that's also going to add in delay because of the distance, even on Internet2. In all, it could be a delay of half a second to three quarters of a second, so you can't play simultaneously." (Orto, 2015)*

The 'game changer' for online musical collaboration and still the most dominant force for telemetric arts collaboration and education came in 2012 with the development of LoLa (Low Latency Audio/Video), a system developed by the Conservatorio di Musica G. Tartini, Trieste, Italy, in collaboration with GARR (Gruppo per l'Armonizzazione delle Reti della Ricerca)<sup>4</sup>. LoLa provides a high-speed audio/video connection that allows for near real time musical performances to occur with musicians across distances of up to 1500 (network) miles with extremely low latency.

In order to use LoLa (a software-based solution) you need very specific hardware. LoLa relies on software optimisation and on high performance audio and video devices. It is configured on a single-purpose high-end PC with compatible peripheral hardware with the minimal software installed, a high-performance video and audio card, and either a specialised video input card and camera or a specialised USB camera. LOLA does not work effectively behind a Firewall and needs to run with a public IPv4 address.

The Royal Danish Academy of Music adopted distance instrumental teaching in 2010, beginning with Polycom (H.323) before moving on to LoLa and other technologies such as Ultragrid and MVTP<sup>5</sup>. They frequently collaborate across Europe, America and Asia on performance and instrumental tuition and in 2016 launched the Global Audition Training project "to educate student musicians about the cultural and historical nuances of the audition and performance experience around the world." (<https://english.dkdm.dk/~media/Files/Internationalt/GAT%20Guideline.ashx>.) This project utilises a high bandwidth multipoint videoconferencing system, ensuring sonic fidelity, to conduct mock auditions that are then critiqued by a panel consisting of Royal Danish Academy of Music, Royal

---

<sup>3</sup> Internet2 is a not for profit computer network consortium which connects over 60,000 U.S. educational, research, government and community institutions

<sup>4</sup> The Italian Academic and Research Network

<sup>5</sup> Ultragrid is a software solution for high-quality audio/video transmission developed in the Czech Republic by CESNET (<http://www.ultragrid.cz>). Also developed by CESNET, MVTP-4K is a portable hardware device based on FPGA technology for transmission of multiple high-definition video channels over a 10 Gigabit Ethernet network.

College of Music (London), Shanghai Conservatory of Music, Cleveland Institute of Music and New World Symphony, Miami.

Modern telepresence technologies such as those listed above can enable significant international collaborations in the performing arts without the need for ever-increasing, climate-destroying and expensive travel. Collaborative teaching across multiple sites in real time enables a reduction in 'Flying Faculty', tying in with the UN Sustainable Development Goals. During one single iteration of our Immersive Telepresence in Theatre project (Coriolanus Online) a rough calculation indicated that we had saved 10.1 tons of CO<sub>2</sub>e by eliminating student travel from Coventry to Tampere. Savings were also made on hostel/hotel costs and rehearsal room hire by working in this manner. In effect, both departments had effectively doubled their staff teams with only a minimum spend on technical equipment<sup>6</sup>.

Telepresence should be able to do ordinary things in an 'un-ordinary' space but also 'un-ordinary' things in an ordinary space, extending the things we do and the people we do them with. Immersive telepresence proposes an innovative but easily implementable solution for long-distance collaboration that is mindful of the role of space and human interaction in fostering learning. Although reliant on technology applied innovatively, the strength of the system should lie in making that technology a non-intrusive tool for increased meaningful personal contact between students and lecturers, performers and practitioners. At the moment, all telepresence technologies (apart from LoLa) have been developed either for high end scientific collaboration or business meetings. They are slowly beginning to make inroads into arts education, but mainly in the Nordic countries where issues of accessibility and the environmental impact on travel are a more pressing concern.

## **2. Learning Design**

Since 1995, the degree programme of acting in Tampere has sought new ways of investigating performance through the use of foreign languages. Each year the students either produced an entire play or scenes from a play in a language unfamiliar to the performers. This technique encourages actors to make use of the body to communicate meaning, focusing on the materiality of the text and physicality of the voice which improves articulation, adding energy to the act of speaking and having a positive effect on body awareness. Coventry University has developed substantial expertise in the field of virtual mobility, as demonstrated by its Online International Learning Programme, embedded into the formal curriculum since 2012 and providing students with an opportunity to interact with peers at international universities, developing intercultural competences and digital skills while collaborating on subject-specific learning activities.

The degree programmes in Tampere and Coventry operate with very different structures and philosophies. Tampere students audition every two years for 12-13 places. It is state funded and lasts five years (three years Bachelor's degree and two years Master's degree). Alongside the University of the Arts Helsinki's Theatre Academy, it is one of only two universities in Finland engaging in academic actor training and research into performing arts. The degree in Coventry, however, is not strictly a degree in acting but in Theatre and Professional Practice, focused more on creating a variety of theatre practitioners from actors to technicians, administrators and educators. The course is modular with each module contributing to the overall degree classification at the end of three years. The course, on average, recruits 30 students approximately each year from roughly 150 applicants through the UK's UCAS system with entry based on examination results coupled with an audition and interview. Students fund their degree through the Student Loans scheme augmenting this with parental contributions/part time employment and tuition fees per year are currently £9250.

---

<sup>6</sup> For the first iteration of the project, matching Polycom systems had to be hired as staff teams could not gain access to those already on campus - they were installed permanently into meeting rooms. For subsequent iterations, equipment was purchased as part of departmental budgets.

Another difference between the degree programmes is that Tampere students often have some professional experience both on stage and in tv/film whereas UK students have mainly performed in school plays and amateur drama/youth schemes before applying. Unlike Finland, there are roughly 63 theatre/drama courses in the UK but this number is constantly changing and does not include joint honours and Master's degree programmes<sup>7</sup>.

In 2015, staff from the theatre courses at Coventry and Tampere universities met with the intention of developing an online course exploring Shakespeare in performance using 'Coriolanus' as the chosen text. A number of technological solutions were explored, ranging from students working together via Skype or Google Hangouts on small sections of the script as well as attempting to get both groups to work together within a traditional videoconferencing room but ultimately all of these solutions turned out to be fairly unsatisfactory. The limitations of these technologies meant that the actors could not be viewed 'full size' as they would be working together over computer monitors seated either at home or in a laboratory. Sound and video were problematic as these technologies relied on webcams and computer microphones and headphones. Even in advanced 'immersive' video-conferencing spaces, the full body could not be viewed and the rooms themselves were too small for any physical activity. These spaces were also filled with desks and chairs that would have to be moved to facilitate any rehearsal session and were often in high demand for meetings and traditional teaching sessions from other subjects. Cameras were fixed to the wall at head height and, as the spaces were small meeting rooms, students had to stand very close to the cameras, filling the screen and reducing the number of participants that could occupy the space effectively. It was clear that a more radical approach to the problem needed to be explored.

The intention behind the eventual project design was to create synchronicity between both sites and to have an invisible technological interface enabling the performers to rehearse in much the same way as if they were sharing the same space in a live sense. Inspiration was provided by Extract/Insert, an installation utilising the online virtual world, Second Life, at the Herbert Art Gallery (Coventry, 2012), devised by Coventry academics Joff Chafer and Ian Upton in association with performance artist Stelarc. In this installation, a large rear projection screen showed a 'virtual space' in Second Life reflecting the actual physical space in the Herbert Art Gallery. Participants in the live gallery space could interact with avatars on the screen through a plinth that 'would insert their image, captured by an infra-red camera, onto a separate screen in the Second Life space visible on the screen' (Chafer in Doyle, 2015 p.249). Separate speakers were installed behind the screen to give the impression that voices were coming from the onscreen avatars.

---

<sup>7</sup> These vary from conservatoire based 'actor training' programmes such as RADA and Central School of Speech and Drama which are almost totally practice based, to more theoretical and historical studies of theatre with a minimum (or total absence) of practical work.



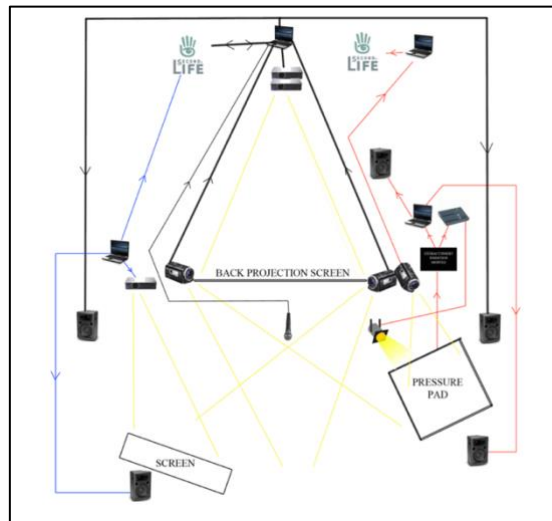


Figure 1: EXTRACT/INSERT SCHEMATIC - The black lines refer to the main set up, the blue lines the extraction part and the red lines the insertion part. (Chafer in Doyle, D. 2015 p.151)<sup>8</sup>

After consultation with technical experts and network technicians in both countries, our project would eventually adapt the basic set up of this installation - the idea of a shared virtual space - requiring a sophisticated yet affordable technological infrastructure. H.323<sup>9</sup> videoconferencing technology was repurposed to operate in conjunction with large scale rear projections in both locations. An 'immersive rehearsal room' was created utilising a unified spatial design mirrored in both Tampere and Coventry with careful use of lighting and directional sound integrated into both spaces to give the actors the illusion that they were occupying the same playing area.

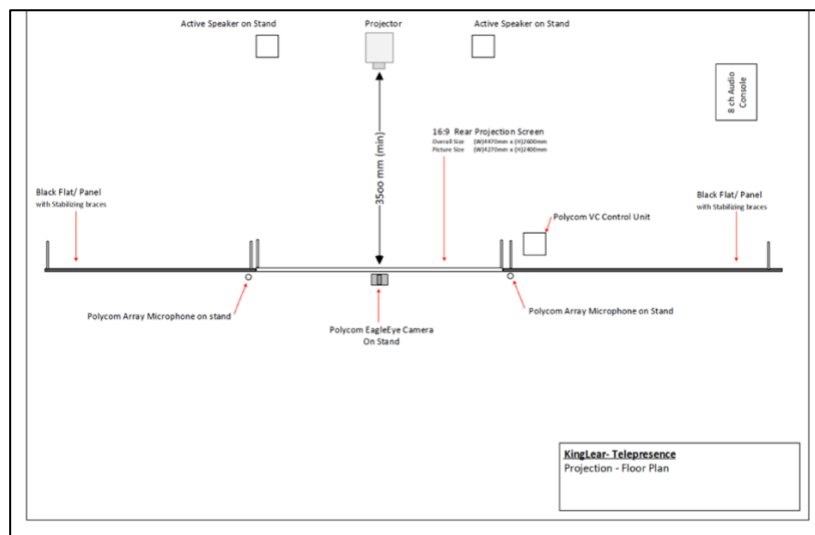


Figure 2: Overhead Schematic of the Immersive Telepresence Space © Mikko Kanninen 2015

<sup>8</sup> <https://www.youtube.com/watch?v=P9raLmlx0qg&feature=youtu.be-Video> behind the scenes tour of Extract/Insert interactions at Herbert Art Gallery 2012

<sup>9</sup> H.323 was chosen over LoLa as it is the simplest and most affordable of the 'high-end' solutions. Although it generates more latency than LoLa, it is quicker and easier to set up at both ends and, for the neophyte, is the easiest system to learn how to operate. It does require some special networking skills and the role of the technicians (in both Tampere and Coventry) in investigating and solving networking issues should not be overlooked.



Both spaces placed the rear projection screens flush to the floor<sup>10</sup> to give the impression of a continuous space with directional microphones placed on either side to pick up the voices of both groups as they moved around the rehearsal space. Speakers were hidden behind the screen to give the impression that the voices of the participants were emitting from with the people onscreen. Careful placement and fine tuning of the cameras and projectors in both spaces enabled the participants to have the ability to make eye contact with each other – an absolutely vital factor in performance work. The bulk of the technology was hidden from view behind both screens with the intention of making the process resemble a traditional theatrical rehearsal as much as possible. Ascott, in 1991, theorised about how artists could interact and collaborate using what was then a relatively primitive technology. Working within a system such as this can be initially disorientating - the participant essentially occupies three spaces at the same time. They are present in their home space, present in the remote location and are, at the same time, mediated through their appearance on the screen. Paulsen (2017) discusses the problem with the 'physical, phenomenological status of the user's body and where, exactly, it is'.



*Figure 3: View of the rear projection screen during set up. The Polycom camera is placed just above average waist height using a thin microphone stand, the screen is flush to the floor and the directional microphones are located either side of the screen*

In the first version of the project (Coriolanus Online), latency proved to be an issue. As the sites were approximately 2555 kilometres apart, there was a lag of approximately one and a half seconds in each interaction between each site. This was noticeable in any activity which required true synchronisation and, in subsequent versions of the project between Tampere and the UK, this latency has been reduced to around 50/100 milliseconds.<sup>11</sup> The general consensus (Miske, 2016) is that (in music) a latency of 20ms gives the impression of the participants being 20 feet apart. Around 40ms (40 feet apart) for musicians, playing together becomes challenging. Theatre can cope with latency times

---

<sup>10</sup> This required some 'crafty engineering' from our technicians who used techniques normally used for holding up stage scenery (rather than the stands that were designed for the screens), in order to get the base of each screen to sit directly onto each floor.

<sup>11</sup> This has been aided by the team having a more sophisticated knowledge of networking and telepresence, aided by their subsequent membership of organisations such as Network Performing Arts Production Workshop (<https://npapws.org>) and The Nordic Centre for Digital Presence (<https://tnt.riksteatern.se/ncdu-in-english>).

slightly higher than these as the nature of the discipline can accommodate a slight delay for thought and response but, even so, many activities during the first iteration of the project had to be adapted in order to cope with the added latency.

*'Temporal separation refers to the time it takes for the actions of one person to reach another while acting together. If the acts are aural in nature - music or speech - then time delay between the actors is a function of the speed of sound in the medium and the distance between them. From speech telecommunications literature concerned with turn-taking interaction, we know that conversation is possible even with one-way delays of up to 500 ms.'*  
(Chafe, Caceres, Gurevich, 2010, p. 982)

With multiple sound sources in a video collaboration session, one of the major issues that can detract from the "sharing the same space" experience is the presence of audio echo. Adding to that, in an acoustically 'live' room such as a large rehearsal space, the hard surfaces can bounce back the sound and, coupled with the latency between the two sites, the microphone cannot differentiate between original speech and the reflected noise from the room. When working remotely with telepresence systems, the delay between sites means that the original signal is eventually transmitted back to the sender through the remote site's loudspeakers, creating the distracting effect of the sender hearing their own words repeated. Systems such as Skype use 'noise gate' software which prevents users from talking at the same time but can be problematic for group vocal activities or synchronous exchanges. One of the advantages of using H.323 videoconferencing equipment is the in-built Acoustic Echo Cancelling software.

These phenomena became apparent to us for the first time during Coriolanus Online in 2016. The Coventry students were located in an acoustically problematic space (Charles Ward Wind Tunnel) which created a multitude of echoes which the Polycom echo cancellation software was unable to cope with. As a result, the actors in Tampere experienced an 'echoing' of their own lines at a slight delay. This was repeated during the 2019 collaboration between Coventry and Purdue where the American students were located in a gymnasium, meaning that the Coventry side experienced this irritating 'echoing' effect which basically sounds as if you are being interrupted mid-sentence. Therefore, when conducting work of this nature, both spaces need to be acoustically damp and some knowledge of sound engineering and microphone placement is needed in each space.

### **3. Coriolanus Online (2016)/Lear Online (2017)**

The initial project, Coriolanus Online, occurred over two weeks in late January/early February 2016 with thirteen students from Tampere and twenty students from Coventry taking part. The course adopted a 'three room' design. The large immersive telepresence space was used for group work (dance lessons, games, warm ups and tutor-directed scenes) and Adobe Connect was used to provide contextual lectures. Adobe Connect also provided each scene group with a 'breakout room' in which students could work on their scenes without tutor supervision.

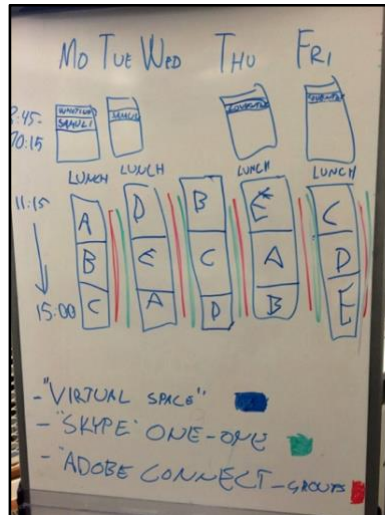


Figure 4: Initial Schedule plan for *Coriolanus Online* (2016). 'Virtual Space' was what we initially called the immersive telepresence space. Skype was eventually abandoned in favour of Adobe Connect.

A Facebook group was created to exchange rehearsal details, research/supporting materials, feedback on the ongoing process as well as advice on how to use the Adobe Connect technology and any changes to the schedule. This group also became a useful space to exchange visual material (photos and videos) from both sides that enabled the team to balance lighting and sound as well as giving the students the opportunity to see the work they were making from the perspective of the opposite space. This digital design was modelled on a physical rehearsal process that would normally utilise a main rehearsal space, breakout rooms and a noticeboard for scheduling and production research/design. After an initial 'meet and greet' session to familiarise both teams with the set-up, students were split into six groups to work together on scenes in both Finnish and English. Subsequent versions of the project have started with an Adobe Connect online orientation session before the main work occurs.

Each day began with a one-hour workshop/warm for the full company up before the individual groups each took an hour to work on scenes in the main space and, in their own time, develop this work in their individual Adobe Connect rooms. These warm ups are usually conducted by a guest artist who has no previous experience of working with the system. This has now been developed as a form of experimentation of what can be achieved within the space. Over the five years of the project we have had vocal classes, movement sessions, yoga, martial arts and, on one occasion, a burlesque class conducted within the main space. In addition to this, a series of contextual lectures are delivered using Adobe Connect on topics as diverse as Renaissance theatre, Finnish theatre history and acting in a foreign language. These academic sessions vary from project to project depending on the objectives of the course and needs of the groups in both countries. All sessions (apart from the warm ups) are taught jointly between both institutions - it is not a 'master class' delivered from one institution to the other. Members of the team are 'present' in the main telepresence spaces at all times. This joint approach can aid issues of translation - both linguistically and culturally. As Shakespearean English is unfamiliar to both UK and Finnish students (and the UK group also included students from other nationalities such as Polish, Romanian, Chinese and Lithuanian) a level of translating the text is needed in order to aid understanding. There are also areas of connotation and denotation within Shakespeare's text that a direct dictionary translation tends to overlook. For example, in *Coriolanus*, the title character calls the Roman mob 'Curs'. A literal translation of this word would be 'dog' or 'mongrel dog' but this still needs further 'translation' within the context of what is happening in the play and cultural differences will also come to affect how we approach the character and the text. A

similar situation occurred during Lear Online (2017) in which the word 'crown' takes on multiple meanings (half an egg, forehead and symbol of authority) during the space of one speech:

**Fool:** *Give me an egg, nuncle, and I'll give thee two crowns.*

**Lear:** *What two crowns shall they be?*

**Fool:** *Why, after I have cut the egg i' the middle, and eat up the meat, the two crowns of the egg. When thou clovest thy crown i' the middle, and gavest away both parts, thou borest thy ass on thy back o'er the dirt: thou hadst little wit in thy bald crown, when thou gavest thy golden one away.*

**King Lear** (I:iv 159-166)

For these reasons, having Finnish and English tutors working together in the same session can aid in creating a common ground, a common set of references for the students to engage with the text. Also, during the Coriolanus Online project a decision was made to examine the scene in both the original and in a Finnish translation. Subsequent versions of the project have only used small sections of the text in Finnish translation (mainly due to time constraints) but this concept of working and performing in two languages is an idea that we hope to return to in future iterations:

**Santeri:** *In Finland, we do have a good education. We know how to speak English. But, when they give you this Shakespeare text - without a translation it's really hard to understand what the author is saying. But we had a few lectures and we translated the scene into understandable English so we would know what the characters were saying. I think the language was the most challenging thing about the project.*

**Steve:** *In England we're taught Shakespeare in school which is not the best way of being taught. So, even though I can pronounce the words... There are these little snippets of text where you do have to get it explained by the director. It's old slang that we no longer use, so it has to be translated for you. And - I love Shakespeare and the language and the poetry - but it does take a while to get used to it. Even watching Shakespeare - it takes a while for your ear to become attuned to it and you can get the mental images and the pictures - it all exists in your head. So, I think the biggest challenge is to put that poetry and the pictures into people's heads.*

*Interview Tampere Acting student, Santeri Niskanen and Coventry Theatre student, Steve Arnold (2017)<sup>12</sup>*

In terms of pedagogy, only very minor modifications had to be made to the normal process of exploring a play-text in this unusual space. The temptation (initially) is to concentrate the teaching to the participants on the screen. The spatial arrangement of the room, with both groups facing the screen in their own locations means that the screen tends to dominate the space. This focus on the onscreen participants is only natural as they appear to be the 'guests' in the host space (albeit 'virtual guests') but it comes at the cost of turning your back on the students in the host space. As a result, the tutor needs to be aware of either teaching whilst standing diagonally to the group or standing further back so that both groups of students are in view during discussion.

---

<sup>12</sup> <https://www.youtube.com/watch?v=CSFUCnV4Fbl&t=104s>



*Figure 5: Group discussion during Galileo Online (2019). Both groups are arranged in semi-circles with tutor (centre, in grey suit) able to see all participants.*

The issue of latency, as well as being a technical and aesthetic nuisance, also affected teaching, especially during the first iteration of the project. As both groups were experiencing latency of around one and a half seconds, truly synchronous activities could be difficult to achieve. A session on Finnish folk-dancing conducted by Tampere choreography tutor, Samuli Nordberg was successful despite this delay as the students were learning unfamiliar steps, observing each side and attempting to replicate the choreography in both countries.

In other instances, the latency caused more problems when attempting activities that would be commonplace in a shared rehearsal room. An attempt at singing an Elizabethan song together proved to be impossible as both sides were totally out of sync with each other, meaning each side eventually had to learn and sing the song separately. Several games that required synchronous activities had to be adapted by the group to account for the delay<sup>13</sup>. As the project developed over subsequent iterations, the latency was reduced by more sophisticated networking techniques leading to a wider range of activities becoming possible in the telepresence space (including group singing)<sup>14</sup>

*It really was quite exciting and great to act via this screen... And, because of the feeling that you were in the same room, you really could feel that - 'Ok. I can really touch someone' - or how to be in a connection when you really can't touch someone physically. It was really interesting to find those connections... So, I find that was really the essential point of this course because I think there's a lot of possibilities for theatre and every working process...*

*What I gained from this course really was the language... The language was really delicate - or the rules of the language that Shakespeare uses are really delicate. It was great to learn them and learn how to break them as well. I think it was really important to learn them from a native because then we were really strict with the rules as well. And something else that I gained was to learn how in different countries and different cultures people work and study.*

<sup>13</sup> This actually led to some very creative solutions from the students who often adapted the activity to cope with the latency, the lack of physical contact and the peculiar nature of attempting to interact with the screen.

<sup>14</sup> <https://www.youtube.com/watch?v=WQRDjkkONI4&t=255s> From 3.50 - 5.44 King Lear Online (2017) singing sessions led by vocal tutor Soila Sariola (Tampere) and Sam Fox of Kiln Theatre (UK)



*Interview with Tampere Acting Student Elina Saarela (2016)<sup>15</sup>*

The space, constructed in pre-existing drama spaces in both institutions, provides students with a level of comfort in working in a familiar (yet repurposed) setting. As the project progressed, the team began to realise that the additional online spaces (Adobe, Facebook) began to function as breakout areas for the group. In any rehearsal or practical process, especially when bringing a group of students together who have not worked with each other before, a number of traditional exercises are used to get a group used to working with each other. As well as established exercises, many of which were attempted in the telepresence rooms, there is also the (often overlooked) social aspect - the coffee break, the post rehearsal drink and the exchange of experiences outside the rehearsal space that actually relate only tangentially to the task at hand. These informal moments build a sense of community amongst a group of student performers.

The team noted that, at the midpoint of the initial course, the work in the online Adobe Connect spaces (as well as the social interactions between the students on Facebook) began to change the spatial and group dynamics in the main rehearsal space. It has become noticeable at the start of each iteration of the course, students are very aware of the camera and the technology, often retreating 'out of shot' when a task is completed. As the week continues, the team notice that the students start to take ownership of the main space, entering the space wishing to try ideas discussed in their individual Adobe Connect rooms. They begin to exchange jokes, dance, sing and arrange meetings for later in the day to learn lines and work on pronunciation of the Shakespearean text. They have become friends rather than scene partners. At the end of Coriolanus Online, students from both universities met in Adobe Connect for a 'virtual beer' to celebrate the conclusion of the two-week course

*One really amazing thing that I discovered in this week was that when we go 'virtual' and when we collaborate in a virtual world, the 'local' becomes very important. Then we can really see the differences and similarities between these student and drama cultures. You can see that it becomes really important 'where we are'. For example, when students went to the bar in Adobe Connect and somebody was at home, somebody was in the bar in Finland and somebody was at school - but they were together and they were really having a student collaboration - with a small amount of alcohol - and they were really keen on asking 'where are you?'. So, the local became highlighted and very important.*

*Interview with Tampere Acting Tutor Mikko Kanninen (2016)<sup>16</sup>*

A second iteration of the project took place in February 2017 and culminated in a field trip to Tampere, where both groups of students (20 from Coventry and 14 from Tampere) performed together live in the Telakka Theatre. The text chosen for this second stage was King Lear and, on this occasion, we explored a variety of scenes - large 'public' scenes and more intimate sections from the text with just two or three actors - in order to examine how this pedagogy enables rehearsal work in these differing circumstances. This second version aimed to refine both the technology and the teaching developed during the initial instalment of the project. Work continued on developing both spaces to give the illusion of one single, unified rehearsal room. The shape of the screen was changed from 4x3 to 16x9 to give more space horizontally for participants to move around. Placement of cameras and projection techniques<sup>17</sup> were central to improving the performer experience, but the team wanted to keep the

---

<sup>15</sup> <https://vimeo.com/182216126>

<sup>16</sup> <https://www.youtube.com/watch?v=DPJpOUYugLo>

<sup>17</sup> Coupled with the change in screen aspect ratio, we began to use projectors with higher lumens ratings and ultra-short throw lenses. This gave us more control over the dimensions of the physical space and the lighting of the playing/teaching area.

equipment used both affordable and user-friendly so that it can be accessible to a wide variety of user groups.

As well as refinements to the space, the students were once again encouraged to play with both the limitations and advantages of working within a telepresence enabled rehearsal room with workshop activities including yoga, Asahi, group singing and choral activities delivered by guest practitioners from both countries. Rather than ignoring the camera, the students began to play with concepts of size, scale and proximity, using the unique features of working within this space to explore a blend between film and traditional stage acting. As the team were aware that the telepresence rehearsals would eventually lead to a live performance in Finland<sup>18</sup>, rehearsals were not used to 'block' the action but rather the screen was used to explore both scenes and characterisation in a more 'metaphorical' sense. Starting the rehearsals 'online' also appeared to intensify and accelerate the more traditional 'live' rehearsals and the increase in the actor's focus in the telepresence space spilled over into the live rehearsals in Tampere.

#### 4. Conclusion

Telepresence is both a technology and a way of working. In fact, it should be thought of as a 'component part' of the pedagogic practices of working online and is best utilised as part of an overall online learning experience. An immersive telepresence room can be the main teaching space but a solid, blended learning experience will need break-out spaces for student work and social activities and digital equivalents to these options should also be built into the teaching design. Certainly, the performing arts can use these technologies for international collaboration, but the ultimate user base can be broad and will only be limited by the imagination of the user.

The Telepresence in Theatre project has expanded its range and scope since the initial projects with Tampere. In February 2018 Coventry and Tampere partnered with the Theatre Academy at the University of the Arts, Helsinki and the University of Gothenburg, Sweden to develop and conduct a course exploring the text of Shakespeare's *Twelfth Night*. In March 2019 we collaborated with Adam Mickiewicz University, Poznań on a two-week course exploring Shakespeare's *Julius Caesar* and in May the same year we worked with the Theatre Department of Purdue University, Indiana on an exploration of Brecht's *The Life of Galileo*. In addition, there have been various experimental offshoots of the project including a 'virtual banquet'/performance held between Coventry and Tampere as part of Coventry's UK 'City of Culture' bid<sup>19</sup> and a performance between Tampere and New World Symphony, Miami featuring a motion captured performer in a virtual set (and musician) in Tampere interacting with a live performer on the Miami stage<sup>20</sup>.

Although digital pedagogy has become a common feature in many performing arts courses with students regularly using Facebook, YouTube and learning management systems such as Moodle and Blackboard as regular parts of their study, 'students often select performing arts programmes at university because of the promise of the viscerality and the co-present experience with fellow actors and an audience' (Crossley, 2012). Because the telepresence space attempts to recreate the physical rehearsal space and the work that is conducted there resembles a traditional rehearsal/workshop process, theatre students have been quick to embrace the system's potential. Working together in this way not only enables artistic, cultural and educational collaboration but also increases the participant's 'techno-literacy'. As the project develops we will continue to develop ways of improving

---

<sup>18</sup> Students did not physically meet the first time – all of the work was conducted online. As the same Coventry students participated in both the *Coriolanus* and *Lear* projects, they were eventually able to meet their counterparts during the 2017 field trip to Finland.

<sup>19</sup> <https://www.youtube.com/watch?v=9OWMGi5ytYk&feature=youtu.be>

<sup>20</sup> [https://www.youtube.com/watch?time\\_continue=483&v=WEMTi6jmnfE](https://www.youtube.com/watch?time_continue=483&v=WEMTi6jmnfE)



audio/video quality as well as continuing to shave valuable milliseconds from latency. Actor training involves the whole body, the voice as well as the imagination and improving the technology whilst keeping it both accessible and affordable will inevitably promote this illusion of a 'shared space'. When the technology 'underperforms' or malfunctions, it becomes intrusive rather than intuitive and so technological developments go hand in hand with pedagogical practice. Even in the primitive form that the initial version of the project existed in, there was a magic to the collaborative process that is best articulated by the students themselves:

**Sara Maria Heinonen:** *"But, once we got a hold of it, it was really a very magical experience to have these people in the same room as you and also in another country, life sized. And also, the form is so weird that it makes you really concentrate. The time was used very well."*

**Tatu Sinisalo:** *"Yeah. And I feel like that small pause or time change between the images of the screens - I think that's going to disappear once the technique goes further on. And actually... all the time I was waiting... like 'they're going to jump through that screen. Any moment now. They're going to run and end up here.' "*

*Interview with Tampere Acting Students Sara Maria Heinonen and Tatu Sinisalo (2016)<sup>21</sup>*

---

<sup>21</sup> <https://www.youtube.com/watch?v=pSU72FYMJfo>

## References

- Ascott, R., 2003, *Telematic Embrace: Visionary Theories of Art, Technology, and Consciousness*, Berkeley, Los Angeles & London, University of California Press. (p.351)
- Ascott, R., 1991 'Connectivity: Art and Interactive Telecommunications', *Leonardo*, Vol. 24, No. 2: (p. 115-117).
- Chafe, C., Caceres, J. and Gurevich, M., 2010. Effect of temporal separation on synchronisation in rhythmic performance. *Perception*, 39(7), (p.982).
- Crossley, Mark. 2012. "From LeCompte to Lepage: Student Performer Engagement with Intermedial Practice." *International Journal of Performance Arts and Digital Media* 8 (2): (p. 171–188).
- Doyle, D. (ed.) 2015. *New Opportunities for Artistic Practice in Virtual Worlds*. IGI Global; 1 edition June 26,
- Fleming, j. *Musical America Special Reports*, 2015  
<https://www.musicalamerica.com/news/newsstory.cfm?archived=0&storyid=34572&categoryid=7> (accessed 27/07/19)
- Global Audition Training: Exclusive and Innovative Live Audition Training  
<https://english.dkdm.dk/~media/Files/International/GAT%20Guideline.ashx> (accessed 24/07/19)
- Gorman, T. [Tom Gorman]. (2017, August 26) *King Lear Online* [Video File] Retrieved from <https://www.youtube.com/watch?v=WQRDjkk0NI4&t=255s>
- Gorman, T. [Tom Gorman]. (2018, January 15) *City of Culture 2021 Telepresence Banquet* [Video File] Retrieved from <https://www.youtube.com/watch?v=9OWMGi5ytYk&feature=youtu.be>
- Gorman, T., Syrjä, T. & Kanninen, M., 2019 *There is a world elsewhere: rehearsing and training through immersive telepresence*, *Theatre, Dance and Performance Training*, 10:2, (p.208-226)
- Manovich, L. 2002. *The Language of New Media*. MIT Press; New Ed edition (p.153)
- Minsky, M. (1980) 'Telepresence', *Omni Magazine*: <https://web.media.mit.edu/~minsky/papers/Telepresence.html> (accessed 12.06.2019).
- Miske, G. (2016) *Feasibility Study for Using Music to Introduce Technology: The Kentucky Initiative* [https://www.slideshare.net/slideshow/embed\\_code/key/88I0sUAabxrGCR](https://www.slideshare.net/slideshow/embed_code/key/88I0sUAabxrGCR) (accessed 24/07/19)

Näty Tampereen yliopisto [Näty]. (2018, June 1) NÄTY NPAPWS Opening Performance [Video File] Retrieved from [https://www.youtube.com/watch?time\\_continue=483&v=WEMTi6jmnfE](https://www.youtube.com/watch?time_continue=483&v=WEMTi6jmnfE)

Nesi P., Santucci R. (eds), 2013. Information Technologies for Performing Arts, Media Access, and Entertainment. ECLAP. Lecture Notes in Computer Science, vol 7990. Springer, Berlin, Heidelberg

Oliveros, P., Weaver, S., Dresser, M., Pitcher, J., Braasch, J. and Chafe, C., 2009. Telematic music: six perspectives. *Leonardo Music Journal*, 19(1), (p.95–96).

Paulsen, K., 2017 *Here/There - Telepresence, Touch and Art at the Interface*, Cambridge, Massachusetts and London, England, The MIT Press. (p.2, p.10)

Shakespeare, W., 1997. *King Lear* ed. Hunter, G.K. The New Penguin Shakespeare. London: Penguin.

### **Interviews**

Gorman, T. [Tom Gorman]. (2019, September 10) Interview Santeri and Steve [Video File] Retrieved from <https://www.youtube.com/watch?v=CSFUCnV4Fbl&t=104s>

Gorman, T. [Tom Gorman]. (2017, August 26) Elina Sareela: Coriolanus Final Thoughts Unedited [Video File] Retrieved from <https://vimeo.com/182216126>

Gorman, T. [Tom Gorman]. (2016, September 15) Mikko Kanninen Interview Unedited [Video File] Retrieved from <https://www.youtube.com/watch?v=DPJpOUYugLo>

Gorman, T. [Tom Gorman]. (2016, September 12) Tampere Acting Students Sara Maria and Tatu Final Thoughts on Coriolanus Online (Unedited) [Video File] Retrieved from <https://www.youtube.com/watch?v=pSU72FYMJfo>

### **Project Website**

<http://telepresenceintheatre.coventry.domains>

## Inclusiveness, and accessibility: adjustments, and services

### Tiberio Feliz-Murias

UNED, Spain

tfeliz@edu.uned.es

### Alejandra Pereira Calvo

UNED, Spain

apereira@pas.uned.es

### Ana Andreu Bueno

UNED, Spain

abandreu@pas.uned.es

### Inmaculada Simón Fernández

UNED, Spain

inma.simonfer@gmail.com

#### **Abstract**

Gamification

#### **1. Introduction**

The UNED is from its birth a university at the service of the democratization of Higher Education. Like all distance universities, it enjoys a notable demand from citizens with disabilities. This inclusive phenomenon is general in the Spanish university, where we represent around 40% of the student population at different university levels. Despite the growth in absolute, and relative terms, the presence of people with disabilities in relation to the general population continues to highlight the need to maintain inclusive policies that encourage the transition from Secondary Education to University.

In this context, our University continues to play an essential role that has been possible thanks to a growing involvement, and commitment of all levels of the university community, and to strong sustained actions over time. Among them, we must highlight the creation of various forms, and services for students with disabilities.

UNIDIS is currently the service that energizes this inclusive action aimed at the involvement of the entire university community towards the development of a culture of inclusion (Feliz et al, 2018). This task is not isolated from the global movement to defend the rights of people with disabilities around the world. We are also debtors of the associative movement that promotes, defends, and supports the conservation of human diversity in all its extremes. Each person is a world, and the world would not be the same without each person. We must therefore express our recognition to all the groups, associations, institutions, and people who have helped us to channel our efforts in this great universal task.

Finally, we have to express our gratitude to all this great university community that includes administration, and services staff, teachers, and students. We are all part of this great movement that every day seeks to generate a space of coexistence for each person, and that goes out every day to meet everyone.

## 2. A university near everyone

The UNED was born in 1972 with a special commitment, whose objective was to facilitate access to higher education to all those who required flexible conditions for study, for their geographical location, for working, for having family responsibilities or for having some type of disability. The main dates of this evolution are:

- 1995: First University in Spain that implemented free public prices for students with disabilities.
- 2000: Creation of the Integration Unit for students with disabilities.
- 2005: Creation of the Disability, and Volunteer Unit.
- 2008: Creation of the Centre for Attention to University Students with Disabilities (UNIDIS).

Responsibility, and promotion in innovation, and research applied to the development of environments, products, services, and services guarantee the principles of inclusion, universal accessibility, design for all, and independent living in favour of people with disabilities or in situations of dependency. The centre strengthens access, permanence, success, and employability of students with disabilities. It also strengthen awareness, promotion, and training towards diversity, full inclusion, and equal opportunities.

The main objective of the Centre for Attention to University Students with Disabilities (UNIDIS) is to normalize the life of university students with functional diversity by offering them the same opportunities as the rest of the University Community of the UNED, and coordinating and developing specific actions of promotion, advice and support for.

According to the Disability Care Guide of Fundación Universia 2018 (Guía de Atención a la Discapacidad de Fundación Universia 2018), the number of students with disabilities enrolled in Spanish universities during the 2017-2018 academic year has been 22,190 of which UNED represents 33.26% maintaining a clear position of leadership.

The main figures of the 2018-2019 academic year reflect this:

- 8,075 students who have declared a disability condition have been enrolled.
- In the set of curricula of the UNED, except for continuing education, a total of 8,976 enrolments of students with disabilities have been registered.
- 1,540 adjustment requests have been received at UNIDIS, of which 1,117 students have been granted.

Although some students do not expressly state this information (which is only required in cases where curricular adjustments or other specific supports are requested) and a person may indicate more than one disability, the Table 1 can give us an idea of the distribution of students according to the type of disability.

Type of Disability	Total	Percentage
Physical	4,826	55.21
Psychic	2,404	27.50
Hearing	682	7.80

Visual	862	9.86
<b>Total</b>	<b>7,436</b>	<b>85.07</b>
Unspecify	1,305	14.93
<b>Total</b>	<b>8,741</b>	<b>100.00</b>

Table 1: Types of disability.

The students with disabilities are mainly enrolled in degrees and Access course for people older than 25 and 45 years-old (Table 2).

Access	980
Degree	7,292
Master	352
CUID (Language School)	350
Doctorate	1
<b>Total</b>	<b>8,976</b>

Table 2: Degrees with students with disabilities.

In general, students with disabilities are many more in faculties with more students (Table 3).

<b>Faculties</b>	
Science Faculty	424
Faculty of Psychology	1,488
Education Faculty	464
Faculty of Philology	395
Faculty of Economics and Business	533
Law School	2,122
Faculty of Geography and History	937
School of Industrial Engineers	129
Faculty of Political Science and Sociology	342
Faculty of Philosophy	461
School of Computer Engineering	240
Access	980
CUID (Language School)	350
<b>Total</b>	<b>8,871</b>

Table 3: Faculties with students with disabilities.

The number of students with disabilities enrolled in the UNED has risen slightly during the 2018-2019 academic year from 7,372 to 8,129 people, unlike the downward trend of the general enrolment of our University. It should be noted, in that sense, the recovery of the enrolment trend with disability.

### 3. UNIDIS

UNIDIS is the Centre for Attention to University Students with Disabilities. The main functions of the centre are:

- Information advice, and guidance to the university community.

- Adjustment management in the teaching-learning processes starting from the needs derived from disability or functional diversity.
- Training, and support teaching developing awareness, and training actions aimed at the university community.
- Coordination of actions to improve physical accessibility, and ICT.
- Development of actions to improve the employability of students, and graduates with disabilities based, among others, in the virtual modality of distance practices.
- Information management on disability in the university environment. Accessible materials edition.

In its procedures, the centre has developed an own workflow and terminology as:

- Adjustments: modifications or accommodations made in order to respond to educational needs arising from situations of disability or specific educational support.
- Resolution: Rector mandate ratifying the granting of adjustments for the realization of face-to-face exams.
- Virtualization: process of including exams with statements adapted from face-to-face tests.

The centre has several sections:

- Technical direction
- Administration
- Psychopedagogical department
- Department of technological, and documentary support

#### **4. Workflow**

According to Andreu Bueno et al (2011), the work process of the centre is:

- a. Enrolment: Students ask for adjustments during the registration.
- b. Collecting documentation: Students send personal, medical documents to demonstrate their disabilities.
- c. Diagnosis: Technical staff contact students to contrast data.
- d. Decision: The centre suggest the best solutions according to our catalogue of accommodations and services.
- e. Resolution: These decisions are reflected on a rector resolution that is mandatory for everyone in the process.
- f. Application of the requested adjustments: Each person implicated during this process is participating designing, making, and applying the needed resources and actions.
- g. Evaluation: During the development of this process, the centre collect information to check the adequacy of adjustments and services.

In this process, the centre determine steps, measures, or decisions to provide better contexts, procedures, and actions for students with disabilities. Some of them are related to teaching-learning processes:

- Study and tutorials



- Sign language interpretation
- Personal assistant
- Volunteering support
- Learning materials (Sama and Sevillano, 2012)
- Technical support
- Specific furniture

At the same time, the assessment is specially focussed since it reflects the equity and justice in the evaluation of results and competences. The assessment could be adjusted as in the process, as in the instruments, as in the contents. It would implicate several options according to the agents who should apply them:

**a. Physical centres:**

- Technical support
- Physical accessibility
- Informatic support
- Space management
- Special furniture

**b. Examining board:**

- Accompanying person
- Support from board
- Longer time
- Location in the classroom

**c. Teachers**

- Contents
- Response format
- Assessment format
- Assessment procedure
- Adapted material

## 5. Future plans

As all services, UNIDIS has to improve the procedures and actions. Some priorities to consider at this moment are:

- Improving adjustments and services.
- Designing and developing an accessibility plan oriented to design for all.
- Increasing opportunities for extracurricular practices in work centres.
- Promoting curriculum training in design for all people.
- Reducing the gap for students with disabilities from secondary school to university.

## 6. References

Andreu Bueno, A. B.; Pereira Calvo, A., and Rodríguez Muñoz, V. (2011). *Guía de adaptaciones y recursos para estudiantes con discapacidad*. Madrid: Universidad Nacional de Educación a Distancia.

Feliz-Murias, T.; Carmen Ricoy, M.C.; Feliz, S. (2018). Inclusiveness of students with disabilities at UNED. Experiences and challenges. *The Online, Open and Flexible Higher Education Conference*, EADTU Conference Proceedings, p. 173-183. Available at <https://conference.eadtu.eu/download2468>

Sama Rojo, V., and Sevillano Asensio, E. (2012). *Guía de accesibilidad de documentos electrónicos*. Madrid: Universidad Nacional de Educación a Distancia.

## Learning analytics of the first Finnish learning analytics cMOOC

### Sami Suhonen

Tampere University of Applied Sciences, Finland  
sami.suhonen@tuni.fi

### Jukka Kurttila

Oulu University of Applied Sciences, Finland  
jukka.kurttila@oamk.fi

### Seppo Nevalainen

Karelia University of Applied Sciences, Finland  
seppo.nevalainen@karelia.fi

### Riikka Muurimäki

Seinäjoki University of Applied Sciences, Finland  
riikka.muurimaki@seamk.fi

### Abstract

This study describes the results of the first Finnish learning analytics cMOOC analytics from the perspective of learning analytics. It provides insight to the participants' progress and course elements. This knowledge can then be used to improve the content and structure of the course for the next implementation. The course was aimed for teachers and learning designers of Finnish universities and was delivered on Moodle platform that generates time-stamp data to the log file. The participants were notified right at the beginning of the course that their data would be used for collecting analytics from this course and later delivered to them in the form of a webinar at the end of the course. This data forms the basis of the analytics. In addition, there was an entry- and a final self-evaluation tests in use. The tests were essentially the same and the aim was to see how the participants perceive their learning during the course. Also, normal course feedback was collected to form more concise view of the course.

The course reached the target group rather well: according to the data there were 426 participants from 34 Finnish institutions, mostly in higher education. Even though this was a completely voluntary course to all participants and did not yield them any credit units, the deadlines showed a clear increase in activity. Also, there was a clear correlation between number of log events and the course completion percentage.

**Keywords:** learning analytics, cMOOC, Moodle log data, diagnostic analytics, descriptive analytics

### 1. Introduction

Learning analytics is a globally growing trend in higher education. Nevertheless, not all teachers or administrative staff are aware of what it is about and what it can provide to teaching and learning. There are learning analytics courses available in English, but not in Finnish. Therefore, a national cMOOC was delivered for teachers and designers, for the first time in Finnish language. The structure, topics and building of the cMOOC course is presented in another article in this conference proceedings ("Building learning analytics cMOOC for teachers and learning designers through online collaboration between universities"). In addition

to providing information to the participants, it itself worked as an example for how to implement learning analytics in single course. According to a survey by European University Association, not all institutional members know what a MOOC is (European University Association., 2013). So, this cMOOC also offered a study experience on MOOC for university teachers and staff.

The need to be able to study independently of time and place is relevant especially in adult and continuing education in which many of the learners work simultaneously with studying. These learners in many cases have also families to take care of. All this reduces both their possibilities to participate in normal face-to-face teaching and to study at normal working hours. A cMOOC course provides time and place independent study opportunities and was thus considered to be the best solution for in-service teachers and administrative staff.

The course consisted of five topics, each lasting for two weeks. The course began with an enrolment period when the participants were asked to take the entry self-evaluation test. All course materials were open to them from the beginning of the course. Kick-off webinar served as an official starting point for the course. During each 2-week period the participants were supposed to complete all assignments of that topic. According to the study by Hone & El Said (Hone & El Said, 2016) the MOOC content, perceived effectiveness and instructor interaction have a significant effect on learner retention. Therefore, to support studying, participants were provided with times for online chat with the instructors. Also, discussion areas for the participant themselves were provided. At the end of the course participants were asked to take a final self-evaluation test. It was identical to the entry-test. At the end of the course, the entry-test results were not visible to participants, so they were not able to copy their answers from the previous test. The course structure is presented in Figure 1.

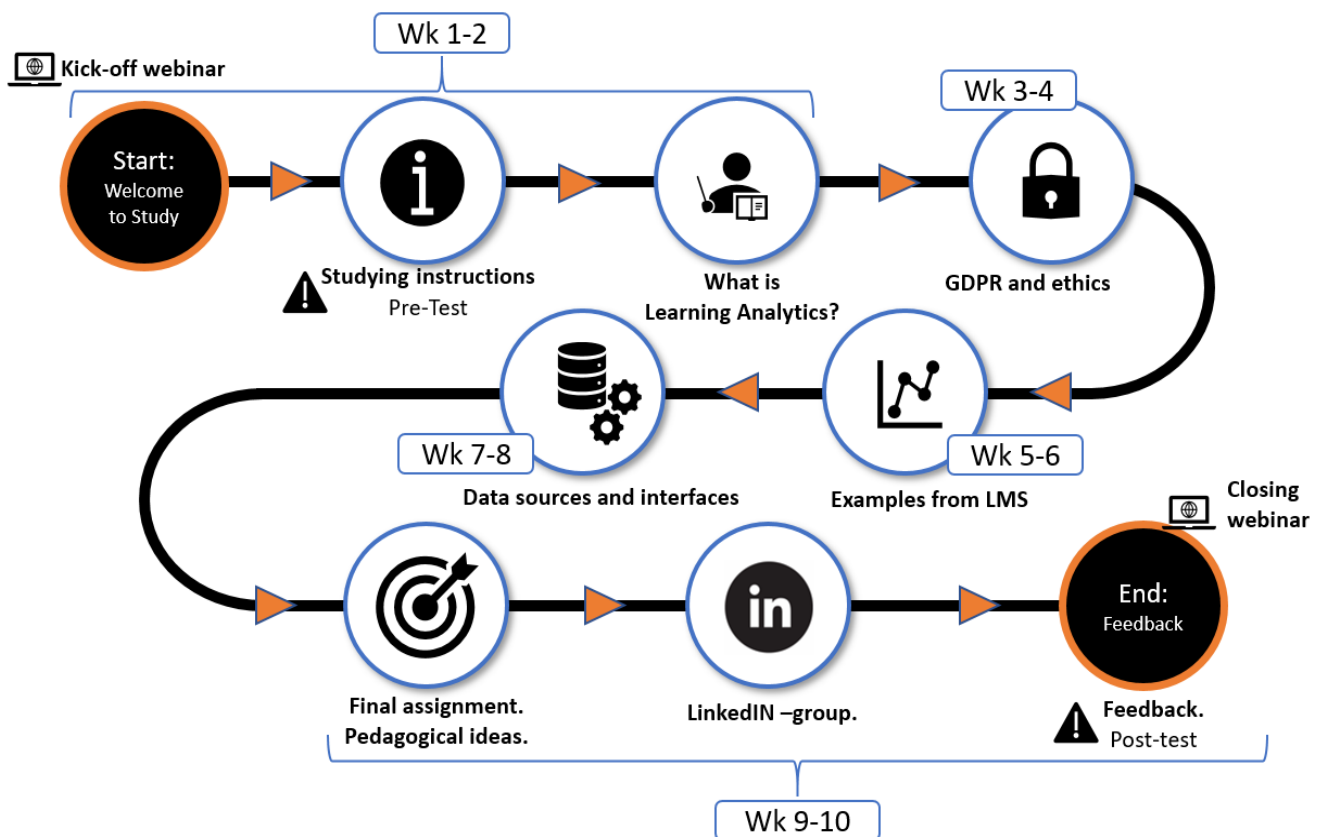


Figure 1: Structure of the cMOOC and week progress.

## 2. Data

Relevant data forms the basis for learning analytics. Some of the data is gathered automatically by the learning management system and some data is generated by the students as answers to tests and surveys. The data gathered in this study consists of four different types of information:

1. Background information of the participants, such as home institution.
2. Moodle time-stamp data in the log file. Simplified, every time a participant clicks on an object on the Moodle platform, the system writes the following information to the log file: date and time, student ID, name of action: material opening, forum post, assignment post, etc., and IP address (Moodle, 2019)
3. Participant self-evaluation of their perception of learning analytics related topics collected as pre-test and post-test.
4. Course feedback.

The Moodle installation in Tampere University of Applied Sciences was chosen to deliver the course. This Moodle installation does not have any analytical add-in tools and therefore the log file was downloaded, and the data was handled in MS Excel. In the course description, the participants were informed about what kind of data is collected from them. Anonymized data was also mentioned to be used in research and in improving the course structure and contents. In Quality Reference Framework (QRF) for the Quality of MOOCs (Stracke et al., 2018) the need for using data and learning analytics for feedback is mentioned. Accordingly, in closing webinar this data the participants had collectively produced was presented back to them as summaries and graphs shown also in this article.

## 3. Participants of the cMOOC

In "Basics of Learning Analytics"-cMOOC there were altogether 426 participants from 34 different institutions in Finland. From universities of applied sciences there were 280 participants (66%), from universities 139 (33%) and from other organisations 7 participants (1%). The number of participants can be considered rather large because cMOOC was available to the staff of Finnish universities only and the language was Finnish. Geographically participants were from a wide area: the majority of the university localities were represented (Figure 2). The designers and teachers of the course were positively surprised by the number of participants and the wide coverage.

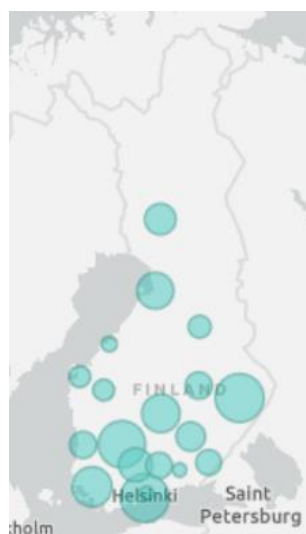


Figure 2: Locations of the participants' home institutions. Circe size represents the number of participants.

## 4. Results

This chapter presents the learning analytics results of the course, the self-evaluation pre-test and post-test results and a summary of the participant feedback. First, the temporal distributions are shown as functions of course day, weekday and time of day. Second, participant activity and course completion are presented, together with their mutual correlation. Third, social network analysis is used to have a look at discussion threads on the course assignments. Fourth, the pre-test and post-test results are investigated for finding out how did the participants perceive their learning of the course topics. And finally, the summary of the course feedback is presented.

All this data forms the basis for further improving next course implementations. Temporal distributions help teachers to schedule chat times according to the average participant online presence, for example. It also shows if there is activity evenly throughout the course and at all topics. Usually the activity peaks day or two before assignment deadlines and exams (Suhonen & Tiili, 2015; Colthorpe et al., 2015).

### 4.1 Temporal distributions

Figure 3 shows the temporal distribution of the daily sum of log events as a function of course day. The course was open for enrollment a couple of weeks before the actual start. The course began with an opening webinar, which had a lot of participants. Thus, the activity is at its highest at that date. Mostly due to the opening webinar, topic 1 has roughly double activity in comparison to the rest of the topics, as can be seen in Fig. 3. During the course, the teachers offered 2-3 chat times for each topic to assist participants if they had any challenges with the assignments. Interestingly the highest spikes seen in the graph mostly coincide with the last chat time of each topic. However, there was not much discussions going on in the chats. It seems that many people came to have a look, if somebody else had initiated an interesting discussion, but only a few did it him/herself.

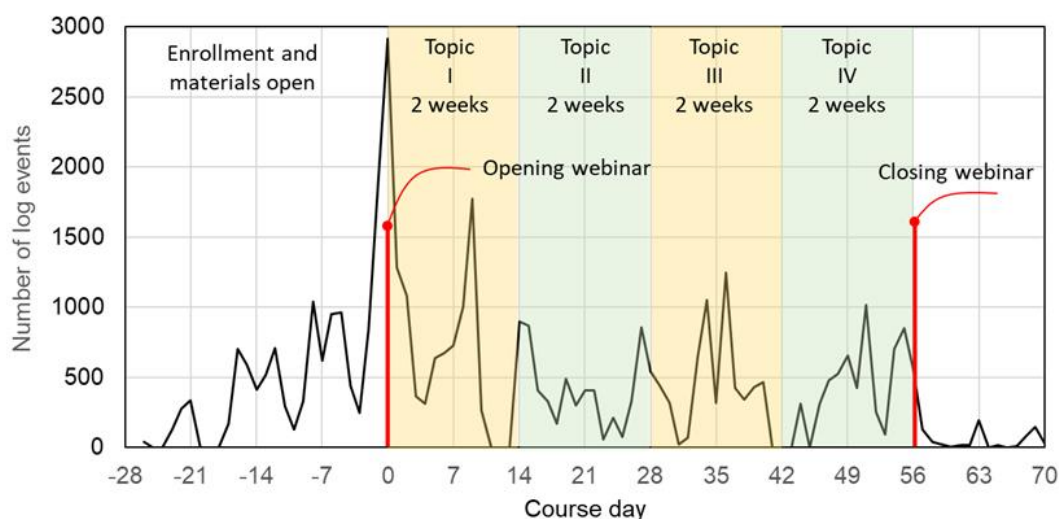


Figure 3: Temporal distribution of the daily sum of log events as a function of course day.

Based on the data in Figure 4, the participants studied mostly during a normal work time. Also, the activity at weekends was not as high as during the weekdays. This is natural, since the participants mostly consisted of in-service teachers and administrative personnel. This is clearly different than the study times of Finnish bachelor level students on online courses. Students usually study at rather late hours and during weekends (Suhonen, 2016; Suhonen & Tiili, 2015).

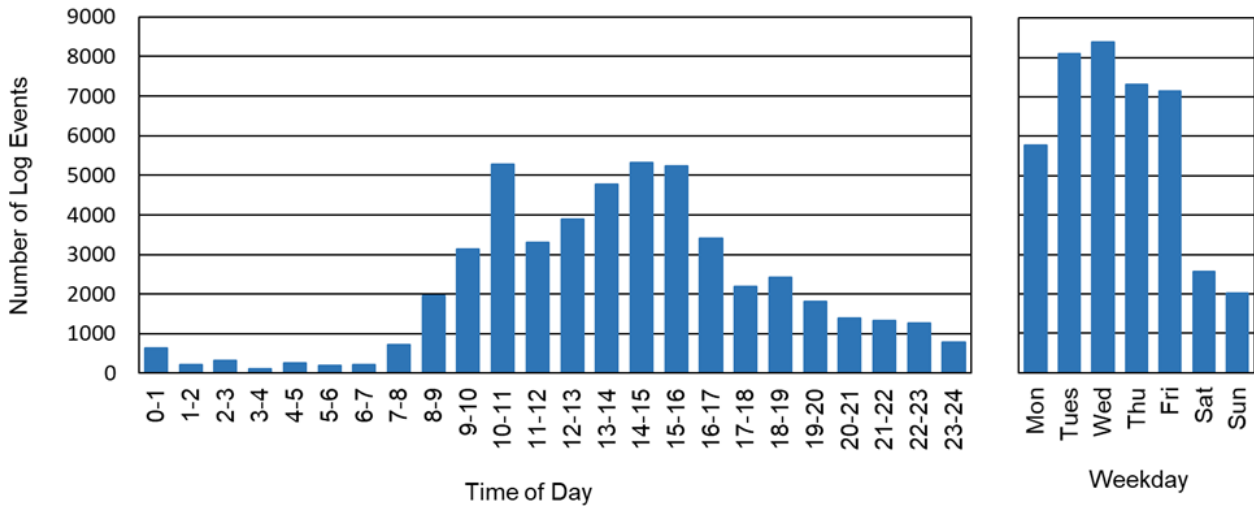


Figure 4: Total course activity (sum of all daily log events) as functions of time and weekday.

#### 4.2 Activity and course completion

Low retention is a known problem or phenomenon in MOOCs, even under 7.5% of the enrolled participants (Jordan, 2014). MOOCs are in many cases used to gather those pieces of information the participants consider relevant for themselves. Many of the participants don't necessarily even plan to complete the whole course. Figure 5 shows the activity of the participants of the course "Basics of Learning Analytics" calculated as the sum of all log events during the course. For the graph, the participants were sorted according to their course completion (A) and course activity (B).

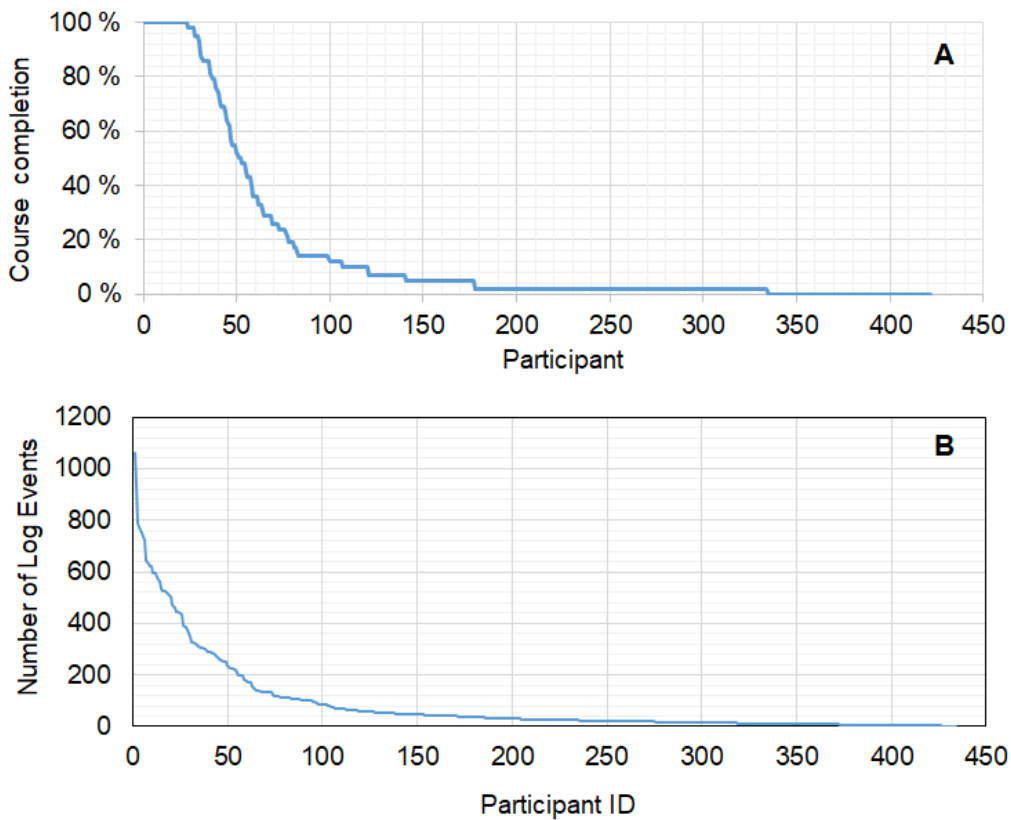


Figure 5: Participants sorted according to their course completion rate (A) and course activity as the sum of all log events (B).



This "Basics of Learning Analytics" cMOOC did not yield any credit units, but it aimed to help the participants to achieve a digital badge "Expert in Learning Analytics" (translated from Finnish). Participants were informed that they should first use their new knowledge and skills in their everyday work and then they could apply for the badge. To apply, they needed to post an article, video or blog post which proved the fulfilment of badge requirements. Thus, there was no outer motivation or "reward" in completing the course. Accordingly, the participant retention on the course was not very high. Of all the participants, 52 (12 %) completed more than 50 % of the course. Even though our course had only 426 participants, the shape of the retention or completion curve is very similar to that of a 60 000 participants course (Anderson, 2014).

The same participants who have high activity may not necessarily have high completion rate (Fig 5.) This is further investigated in Figure 6, which shows the participant completion rate (y) as a function of activity (x). The activity is calculated as the sum of all log events for each participant. Clearly, there is a correlation between activity and completion. The linear fit yields  $r^2$ -value of 0,84. The correlation tells that on the course it was not possible to just complete the tasks and get high completion rate without actually putting a high effort on studying and completing assignments. This is in accordance with findings in other studies, for example Anderson et al. (Anderson, 2014) have investigated the correlation between final grade and number of assignment submissions, quiz submissions, lecture video consumption and forum thread reads. Based on their data, the correlation seems to be mostly rather linear, except for the best ones. Similar trend is also visible in our data. It seems that the total number of log events thus works quite well in describing student activity and achievement on the course.

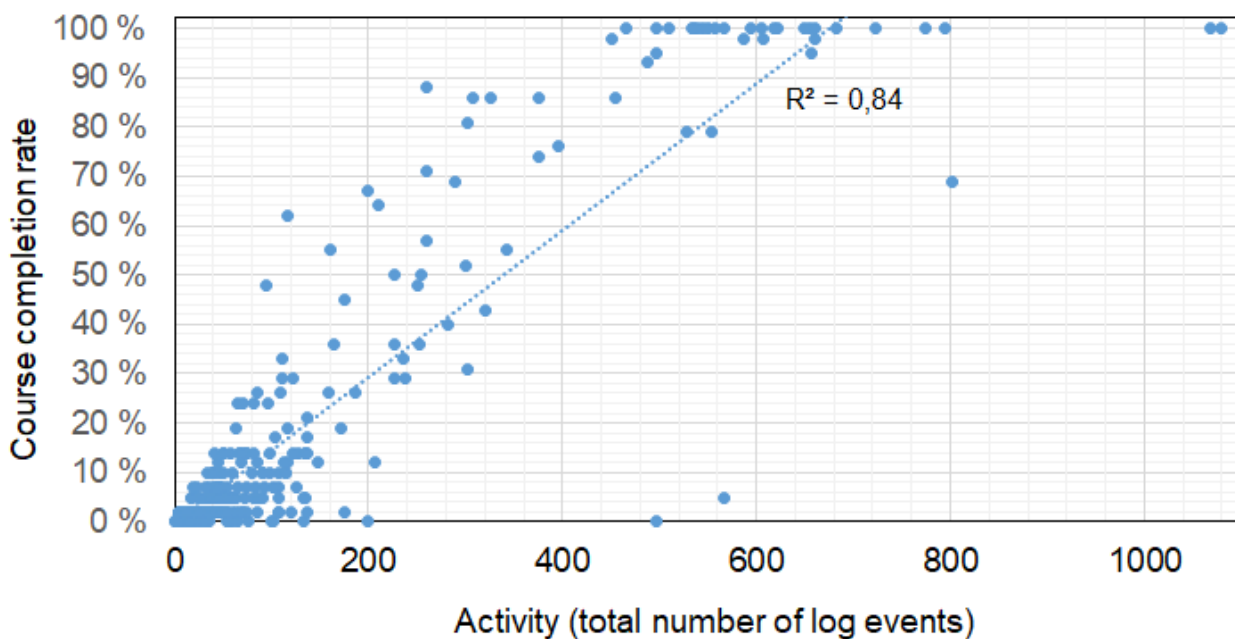


Figure 6: Correlation between participant's activity on the course and course completion rate for all 426 participants. Linear regression yields an  $r^2$ -value of 0,84.

### 4.3 Social network analysis

The course was supposed to be collaborative MOOC. Therefore, the participants were asked to asynchronously comment on each other's posts in the assignments. Chat times were also suggested for synchronous discussions. In one of the assignments the participants were asked to find an interesting international article

about learning analytics and summarize it in the post. Everyone was also asked to comment on at least one of the other posts.

There are some preliminary studies in which the aim is to enable massive-scale automated discourse analysis and data mining of discussion forums (Ezen-Can et al., 2015). However, in this study, social network analysis (Carrington, 2005) was used to have a look to the collaborative element of the cMOOC. The result is shown in Figure 7. Each circle represents one of the 65 participants who have answered to this assignment. Arrows show commenting between participants. Based on the graph, only few participants have been left totally without comments. On the other hand, most of the arrows point just one way. Therefore the graph tells that the assignment answers consists mostly of one-way comments to posts rather than actual dialogue. Furthermore, there seems to be three topics which have attracted a lot of commenting compared to others. Simplified, those topics were: what do the students want of learning analytics, how to improve teaching with learning analytics and how to make better educational videos based on learning analytics. All very important aspects.

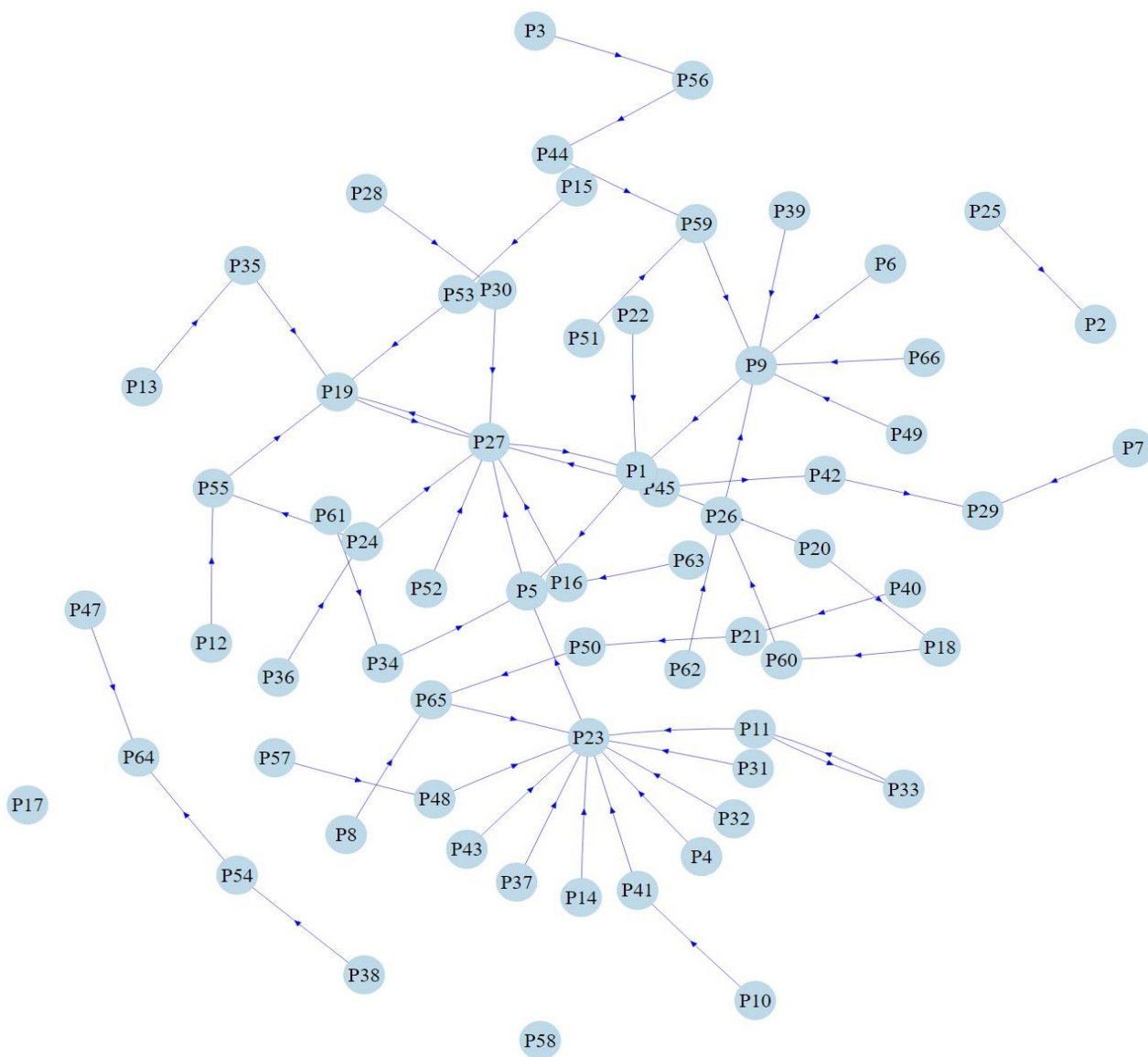


Figure 7: Social network analysis of one of the assignments. Each circle represents one of the 65 participants who have answered to this assignment. Arrows show commenting between participants.

#### 4.4 Pre-test and post-test

In Figure 8 the average results of entry self-evaluation test and final self-evaluation test are presented. The test was exactly the same and consisted of 14 statements to which participants were asked to respond "fully agree", "agree", "undecided", "disagree" or "fully disagree". The statements are shown in Figure 9. Figure 8 summarizes both tests showing the average over all statements and all participants. In pre-test, there were many more respondents (273) than in post-test (37).

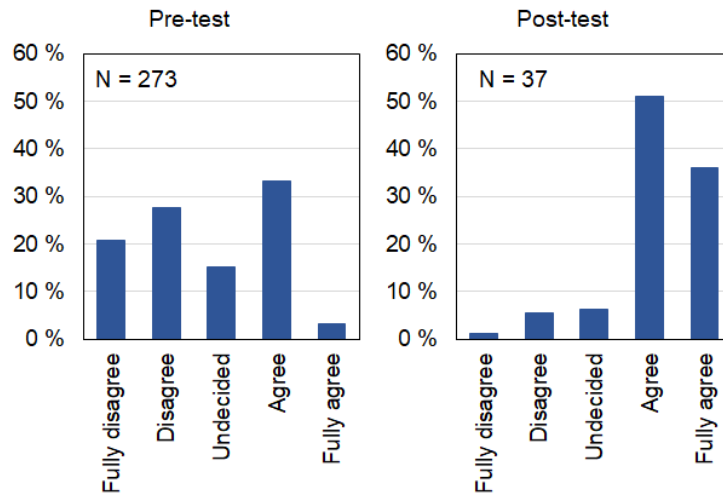


Figure 8: Response averages of all statements and all participants in pre-test and post-test.

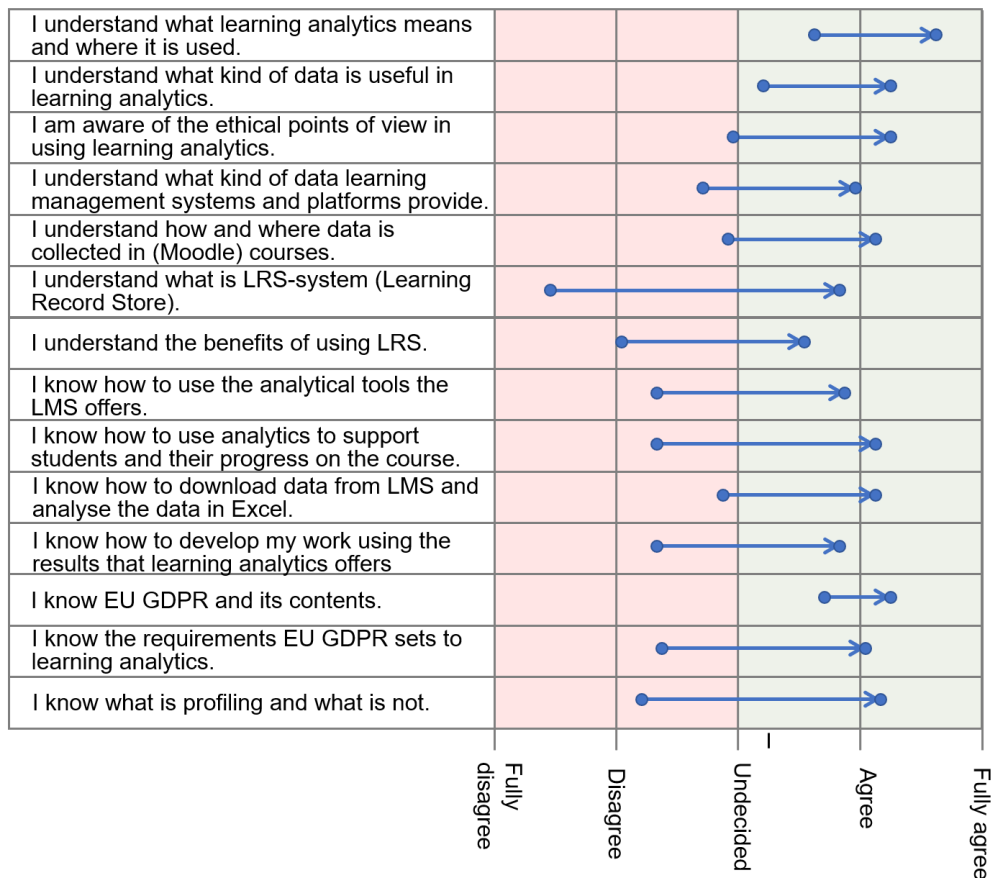


Figure 9: Averages of responses of 24 participants to pre-test (left end of the line) and post-test (right end of the line).

Not all persons who took entry self-evaluation test answered final self-evaluation test and vice versa. Since the respondents are not the same in the tests, Figure 8 doesn't tell about individual participant's learning. Therefore, responses were filtered to cover only those people who answered both tests. This resulted in 24 participants and their responses to all statements are summarized in Figure 9. Left end of the line is the entry self evaluation result averaged over all respondents and the right end that of final self-evaluation test, accordingly. Thus, the length of the line represents the average "amount of learning" during the course. It can be seen that the basics of learning analytics was already known to many of the 24 respondents at the beginning of the course. Nevertheless, they learned something new on the course, and gladly, no line is negative. Most unknown topic before the course seems to have been learning record store. Surprisingly, the eu GDPR was rather well known even before the course. On the other hand, it would have been hard for university staff not to hear about it during this year and spring when it came into action.

#### 4.5 Participant feedback

Normal participant feedback was also collected. It consisted of 24 statements to which participants were asked to respond "fully agree", "agree", "undecided", "disagree" or "fully disagree". There were 43 answers to this feedback survey. Since presenting all questions and their response distributions would be rather large set of data, here only a summary is presented. The statements were categorized into 6 groups according to what they measured and the summary is presented in Figure 10. The categories were:

- Course structure.
- Scheduling.
- Digital tools used and technical aspects of the course.
- Materials offered in the course.
- Communication and interaction among participants and with teachers.
- Assignments and assessment.

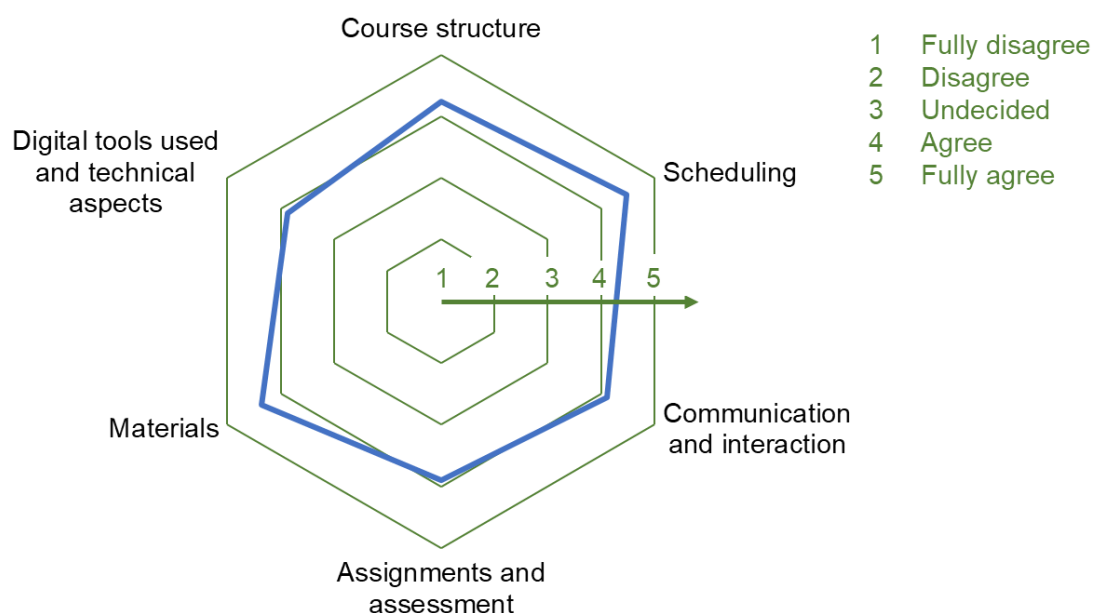


Figure 10: Summary of the course feedback.

It seems that all respondents were rather happy with the course in all aspects. In open ended feedback questions many of them commented that they were able to start using learning analytics in their work at some level after the course. Some participants commented that the course demanded such technical skills which they didn't possess, including advanced use of Excel. There were also some good suggestions for improvement: Since the number of participants was large, it would have been beneficial to do some assignments in small groups. Then the collaboration could have been deeper - in large mass it reduced to commenting a few articles.

## 5. Conclusions

One of the objectives of delivering this Finnish course "Basics of Learning Analytics" was to increase the basic knowledge and awareness of learning analytics among university teachers and staff. Based on the number of participants and their geographical distribution, this goal was achieved. After the course many teachers said that they have started using learning analytics in their work. The course itself also worked as an example of using learning analytics and the results were presented to the participants in closing webinar. This hopefully gave them still new ideas how to analyse participation, activity, learning and feedback on a course

A cMOOC is supposed to be collaborative in which participants construct their new knowledge together and learn from each other. This collaboration aspect was not very strong on the course and it reduced mostly to one-way commenting on each other's posts in assignments. For the next implementation, this should be improved. In feedback, participants suggested forming small groups within the cMOOC so that true collaboration would be easier to boost. This is worth trying next time.

## 6. References

- Anderson, A., Huttenlocher, D., Kleinberg, J., & Leskovec, J. (2014, April). Engaging with massive online courses. In Proceedings of the 23rd international conference on World wide web (pp. 687-698).
- Carrington, P. J., Scott, J., & Wasserman, S. (Eds.). (2005). Models and methods in social network analysis (Vol. 28). Cambridge university press.
- Colthorpe, K., Zimbardi, K., Ainscough, L., & Anderson, S. (2015). Know thy student! Combining learning analytics and critical reflections to develop a targeted intervention for promoting self-regulated learning. *Journal of Learning Analytics*, 2(1), 134-155.
- European University Association. (2013). Internationalisation in European higher education: European policies, institutional strategies and EUA support. European University Association asbl: Brussels.
- Ezen-Can, A., Boyer, K. E., Kellogg, S., & Booth, S. (2015). Unsupervised Modeling for Understanding MOOC Discussion Forums: A Learning Analytics Approach.
- Hone, K. S., & El Said, G. R. (2016). Exploring the factors affecting MOOC retention: A survey study. *Computers & Education*, 98, 157-168.
- Jordan, K. (2014). Initial trends in enrolment and completion of massive open online courses. *International Review of Research in Open and Distance Learning*, 15(1), 133-160.
- Moodle (30.9.2019). Moodle Logs. Retrieved from <https://docs.moodle.org/37/en/Logs>
- Suhonen, S., & Tiili, J. (2015). Students' Online Activity on a Fully Online Introductory Physics Mechanics Course. In Proceedings of SEFI2015 43rd Annual Conference, Orleans, France.

Suhonen, S. (2016). Students' experiences of different types of (distance) learning. In Proceedings of The Online, Open and Flexible Higher Education Conference, Rome, Italy.

Suhonen, S. & Tili, J. (2015). Students' Online Activity on a Fully Online Introductory Physics Mechanics Course. In Proceedings of SEFI2015 43rd Annual Conference, Orleans, France.

Stracke, C. M., Tan, E., Teixeira, A. M., do Carmo Pinto, M., Vassiliadis, B., Kameas, A., ... & Vidal, G. (2018). Quality Reference Framework (QRF) for the Quality of Massive Open Online Courses (MOOCs): Developed by MOOQ in close collaboration with all interested parties worldwide.

## Learning Analytics, Ethics and Participant Privacy

Dr. Brid Lane

IBAT College Dublin & Dublin City University (DCU), Ireland

[brid.lane@dcu.ie](mailto:brid.lane@dcu.ie)

Dr Eamon Costello

Dublin City University (DCU), Ireland

[eamon.costello@dcu.ie](mailto:eamon.costello@dcu.ie)

### Abstract

The field of Learning Analytics' ultimate promise is that it can turn insights into action so as to improve learning experiences and outcomes. Efforts have been made to consider the ethical implications of this field such that learners are properly protected in such research. However, surprisingly little research has been conducted into how researchers in the field actually handle issues of ethics and participant rights as evidenced in published studies. In this paper we address this gap by conducting a literature review and analysis of Learning Analytics research. We analysed 104 papers and found that a majority (60) made no mention of ethics or ethical approval for the research. We found differences in opt-in and opt-out policies for learners in the published studies. It was not always clear that full learner consent had been given in many studies. We highlight considerable absence of details in ethical reporting and recommend that future learning analytics research studies clearly detail the ethical activities followed.

**Keywords:** learning analytics, ethics, student privacy.

### 1. Introduction

Learning analytics collects data on users while they are engaged in the learning process and then converts these into actionable insights that when applied appropriately can improve that learning. They are useful in predictive analytics detecting if a student is not progressing as they should, and thereby boosting retention, and in tackling student disengagement. While there is no doubt that there is some value in the multitude of empirical research that has emerged, there is a need to consider the position of the students themselves. The digital footprints that students leave behind to inform the learning analytics data can be very large. This paper asks to what extent researchers have detailed their activities and processes in handling of student data. As researchers and teachers it is incumbent on us to ensure we are taking due consideration of our students right to have their data properly protected, their privacy respected, and their consent sought if their personal data is to be used in the provision of their education.

More formally, ethical responsibility might reasonably include ensuring students are aware that their data is being collected, how it is being used to further their education, and who has access to it, and that they agree with all this (Garaizar & Guenaga, 2014). The need for an ethical stance is widely proclaimed in the written literature. Sharon Slade and Paul Prinsloo have written extensively on ethics in learning analytics. In Prinsloo & Slade, 2013, they criticised Higher Education institutions in general for not going far enough. The suggestion is that existing policy frameworks tend to reflect what is legally required in terms of data privacy but might not be adequate in terms of the ethical challenges inherent in capturing and using student data in learning analytics activities. They compared ethical practices concerning student data across three MOOC providers (Coursera, EdX and Futurelearn) in Prinsloo & Slade, (2013), concluding that it is all too easy to become over-enthused with what learning analytics can offer, and then neglect the due attention required on details such as student consent. They later highlighted that ethical concerns are too often not addressed in learning analytics activities in educational institutions, and offer a typology of sorts to address this (Willis, Slade & Prinsloo, 2016).



This was supplemented by their 2017 piece, interestingly titled "An elephant in the learning analytics room – the obligation to act" which detailed ethical obligations shared between students and their chosen institution of study, and how they might be tackled (Prinsloo & Slade, 2017).

There is sometimes an unwritten assumption that students want to share their data with educational institution. This might not be the case. Addressing shared obligations is a most difficult task indeed if one party is unwilling to share their data, or there are unknowns on either side. Privacy policies around learning analytics are challenged when students are unaware of their privacy rights. The problem of education institutions being unaware of their obligations should be much reduced (at least in Europe) with the implementation of the Generalised Data Protection Regulation (GDPR). Legal obligations are likely an influencing factor in the design of learning analytics activities as educators and researchers try to balance privacy, pedagogy and technical development in their learning analytics endeavours (Hoel, Griffiths & Chen, 2017). It is a difficult balancing act, there are trade-offs even within the privacy mechanisms employed and no single technical solution to addressing the problem (Gursoy, Inan, Ecran-Nergis & Saygin, 2017).

## **1. Research Focus**

We have outlined the importance of ethical aspects in learning analytics and the difficulties in ensuring they are sufficiently tackled. Nonetheless, there is a need to investigate if researchers in learning analytics are giving due consideration and attention to the ethical issues in their studies.

As one part of their research, Rebecca Ferguson and Doug Clow at the 2017 LAK Conference searched for evidence for quality in learning analytics research (Ferguson & Buckingham-Shum, 2012). They searched for the stem 'ethic-' in the 22 papers of the "Higher Education in the LACE Evidence Hub", and found that just three had explicitly considered ethics. This is surprising given that this hub (Learning Analytics Community Exchange, 2018) deals exclusively with learning analytics. Our research expands on this by taking a more in-depth search through a much wider corpus of research papers, across a range of academic journals. Our overarching research objective was to determine what information (if any) is given in empirical published research in the field of LA about the handling and management of student personal data. Specifically, we sought to determine if studies reported having received institutional approval from an ethical review board, whether they mentioned informed consent and how they treated anonymization of data.

## **2. Method**

We adopted a systematic literature review approach (Petticrew & Roberts, 2009), (Okoli, 2015) for this study. Systematic literature reviews can be seen as a rigorous approach to analysing a large but distinct corpus of literature on a topic. They give an overview of that topic, can identify weaknesses or gaps in understanding, give a structured approach that may help mitigate potential researcher bias, and as they are clearly documented and are potentially more reproducible.

A systematic literature review first specifies a set of inclusion criteria to describe the topic (Okoli, 2015). The inclusion rules here specified that studies meet five criteria: (1) be empirical research i.e. we excluded theoretical, commentary or work in progress pieces (2) be clearly related to learning analytics research, (3) be written in English, (4) be published between 2016 and 2017 inclusive, (5) be published in a peer reviewed journal or conference proceedings.

We chose to use the Scopus database as our search tool. One of the advantages of using Scopus as source over others is the reliable metadata it contains about articles (Dawson, Gašević, Siemens & Joksimovic, 2014). In order to be indexed by Scopus journal articles and conference proceedings must meet various criteria related to the research quality, including clear peer review policies, editorial board appointments, ethics policies, plagiarism checks etc. All of the major sources of MOOC related research are indexed in Scopus such as relevant ACM proceedings (Learning Analytics and Knowledge,

Learning @ Scale), Springer Lecture Notes in Computer Science (European MOOCs Stakeholder Summit Proceedings; European Conference on E-learning) IEEE proceedings (Learning with MOOCs Conference). Scopus also has a very wide coverage of the relevant journals in the field.

Following a trial of various search terms, we developed a search query comprised of the key term "learning analytics" and common variations thereof ("metrics", "learning metrics", "learning prediction") to search for the relevant papers within Scopus. The abstracts of these papers were then examined to determine their inclusion in the final corpus. The search terms used to examine these papers to screen for inclusion were as per Table 1 below.

**Table 1.** Search terms used to screen papers for inclusion.

<b>Stem</b>	<b>Variations included</b>
Ethic	Ethics, Ethical
Priv	Privacy, Private
Permi	Permission, Permitted
Consent	Informed Consent
Anon	Anonymity, Anonymous, Anonymised, Anonymized
Pseud	Pseudonym
Transpar	Transparency, Transparent
Legal	
Law	
GDPR	

### 3. Results

Similar to Dawson et al (2014) we found a large number of conceptual papers as well as the empirical research pieces. Of these papers that we found, those that didn't implement empirical research in LA involving student data were split between position papers and other opinion-style pieces, literature reviews, editorials, technology proposals, framework proposals, panel discussions, workshop reports, and those whose primary data was not learning analytics data, but rather some other data e.g. survey data.

The screening criteria to select the papers, and the subsequent searching within them returned 130 papers. Of the 53 empirical papers for 2016, 42 were available in full-text to us. Of the 77 empirical papers for 2017, 62 were available to us in full-text. The total number of papers suitable was therefore 104.

60 of the papers made no mention of any of our stem terms. There could be many explanations for this. It is possible that nothing at all was done to address the ethical issues involved. Alternatively, due consideration might have been given but the authors considered ethics as of lesser importance and thereby chose not to include them. They may have been taken care of by institutional procedures separate to the given research and thereby not directly in the domain of the researchers. Whichever, it is nonetheless concerning for those reading these papers to see no details at all given on how students data was handled and managed from an ethics perspective.

Just 9 of the research papers talked about consulting students about the research that involved their data. All but one of these reported seeking and receiving informed consent from their respondents. One merely informed students that their data was to be included. In this particular case, the researchers made a point of saying their institution does not allow students to opt-out of having their data used for learning analytics research. It should be noted that this was the only one of the papers that went into detail in the explanations given to their students on exactly how their data was used for learning purposes.

The stem for "pseud" returned only three papers. 21 papers (including one of the "pseud" papers) reported they anonymised either the student names or their data that could identify them. While most just mentioned that anonymisation was done, some were quite specific on how this was done, pointing to the algorithms that were used in the anonymisation process. One considered the student's ID Number to be a sufficient anonymiser.

There was specific mention of obtaining institutional approval for the research in 7 cases. These varied across the institutions' ethical policy process, ethical committee, privacy process, institutional review board, and human ethics committee. Some merely mentioned this approval had been sought. One, dealing with students studying a medical domain, gave more specific details of what was involved. Health data is considered sensitive personal data and so it is to be reasonably expected that this domain would be detailed in their handling of any personal data, including student data.

#### **4. Discussion & Conclusion**

From the above results, it appears that more could be done by researchers in learning analytics in their handling of student data. Under the EU GDPR, students have a right to know what data is being collected on them and how it is being used. A large number of the papers we analysed did not say that they did this. There is a risk then of the possibility of operating without due consideration for the legal requirements and just the ethical ones.

Following (Dawson, Gašević, Siemens & Joksimovic, 2014) we are not claiming that the research we looked at was necessarily actually unethical. Rather, we are noting that the authors gave too little and in many cases no information at all, about what ethical activities or procedures they followed. Yet, as per Colledge (2014) we recognise that there needs to be recognition that balancing privacy and ensuring good quality usable data is a trade-off. It is arguably too strict to insist students allow their data to be used in learning analytics, and so an opt-out is needed. At any rate, legislation such as the GDPR specifically requires that data subjects specifically opt-in to having their data collected, and are unlikely to tolerate any coercion on students to share their data. Yet, without this student data, the value arising out of learning analytics is greatly reduced. Similarly, students need to be made aware that their activities are being recorded, why it is being recorded and how it will be used. However, this is not an easy task to do clearly and with precision, so that students feel in control of their privacy without overwhelming them with privacy policies and procedures [LAK, 2017], such that they opt-out of sharing that data.

Across all the publications we looked at, just one talked at length about legislation. Garaizar and Guenaga (2014) discussed movement towards increased regulation in data practices, citing the Europe Directive 95/46/EC, extended with directive EUP 2002. Publishing in 2014, they were too early for the GDPR and the promises that holds. Nonetheless, they expressed concern that technology and the uses it is put to simply changes too fast for the law to keep up. As a result, they recommend that the learning analytics community should self-regulate, calling for a framework to guide ethical and privacy-related issues in learning analytics research to help in doing this, and thereby build confidence among the various parties involved in LA. Slade and Prinsloo (Willis, Slade & Prinsloo, 2016) and (Prinsloo & Slade, 2017) have created such a framework however we have shown here that despite such tools there is an under-reporting of ethical issues in the literature.

Several possibilities exist for furthering the research. One dimension that could be added to continue the results of this paper concerns the geographical provenience of the authors of the reviewed papers, looking at any relevant difference in how authors take into consideration ethical issues in learning analytics based on their geographical provenience. Other possibilities are to compare different forms of learning analytics, the contexts in which learning analytics are used, varying types and formats of student consent.

This study makes a contribution to the debate around ethical issues in Learning Analytics by highlighting the absence of ethical treatment in study design as evidenced in the published literature. Our recommendation is that research funders and editors of published papers put processes in place to make reporting of ethical issues standard in such research.

## 5. References

- Colledge, L. (2014). Snowball metrics recipe book. *Amsterdam: Snowball Metrics Program Partners, 110*.
- Dawson, S., Gašević, D., Siemens, G., & Joksimovic, S. (2014). Current State and Future Trends: A Citation Network Analysis of the Learning Analytics Field. *LAK 2014*. Indianapolis, IN, USA.
- Ferguson, R., & Buckingham-Shum, S. (2012). Social Learning Analytics: Five Approaches. *2nd International Conference on Learning Analytics & Knowledge (LAK)*. Vancouver, BC, Canada. Retrieved from <http://oro.open.ac.uk/32910>
- Ferguson, R., & Clow, D. (2017). Where is the evidence? A call to action for learning analytics. *LAK '17*. Vancouver, BC, Canada.
- Garaizar, P., & Guenaga, M. (2014). A Multimodal Learning Analytics View Of HTML5 APIs: Technical Benefits And Privacy Risks. *Technological Ecosystems for Enhancing Multiculturality (TEEM)*. Salamanca, Spain.
- Gursoy, M. E., Inan, A., Ercan Nergiz, M., & Saygin, Y. (2017). Privacy-Preserving Learning Analytics: Challenges And Techniques. *IEEE Transactions on Learning Technologies, 10(1)*, 68-81.
- Hoel, T., Griffiths, D., & Chen, W. (2017). The Influence of Data Protection and Privacy Frameworks on the Design of Learning Analytics Systems. *LAK '17*. Vancouver, BC, Canada.
- Learning Analytics and Knowledge (LAK) Conference (2017). Retrieved September 29, 2019, from <http://lak17.solaresearch.org>
- Learning Analytics Community Exchange (LACE) (2019): <http://evidence.laceproject.eu>. Retrieved September 29, 2019
- Okoli, C. (2015). A Guide To Conducting A Standalone Systematic Literature Review. *Communications of the Association for Information Systems, 37*. Retrieved from <https://search.proquest.com/docview/1763749504>.
- Petticrew, M., & Roberts. (2009). *Systematic Reviews in the Social Sciences*. Malden, MA, USA: Blackwell.
- Prinsloo, P., & Slade, S. (2013). An Evaluation Of Policy Frameworks For Addressing Ethical Considerations. *Third International Conference on Learning Analytics and Knowledge Learning Analytics (LAK)*. Leuven, Belgium.
- Prinsloo, P., & Slade, S. (2015). Student Privacy Self-Management: Implications For Learning Analytics. *The Fifth International Conference on Learning Analytics and Knowledge (LAK)*. Poughkeepsie, New York. Retrieved from <https://pdfs.semanticscholar.org/09d7/56d7a66f002f5c06b05237c3fc162b61a653.pdf>
- Prinsloo, P., & Slade, S. (2017). An Elephant In The Learning Analytics Room - The Obligation To Act. *LAK '17*. Vancouver, BC, Canada.
- Willis, J. E., Slade, S., & Prinsloo, P. (2016). Ethical oversight of student data in learning analytics: a typology derived from a cross-continental, cross-institutional perspective. *Education Technology Research Development, 881-901*.

## Mapping the Learner Profiles in Open and Distance Learning

### Aylin Ozturk

Anadolu University, Turkey  
aylin\_ozturk@anadolu.edu.tr

### Alper Tolga Kumtepe

Anadolu University, Turkey  
atkumtepe@anadolu.edu.tr

### Sinan Aydın

Anadolu University, Turkey  
snaydin@anadolu.edu.tr

### Abstract

As the number of learners has dramatically increased due to the opportunities presented by communication and information technologies in Open and Distance Learning (ODL) institutions, so has the variety of learners in this line of education. The innovative ODL technologies have made it possible to bring together demographically diverse learners with distinct educational backgrounds, needs, and interests. Notably heterogeneous nature of the learner population requires ODL institutions to develop educational strategies to better cater to the diversity, which also poses unique challenges in decision-making processes. Learner profiles and unique characteristics need to be mapped for the ODL institutions to make better-informed decisions on the educational processes to support learner-centred approaches and develop customized and individualized learning environments. Through mapping learner profiles and characteristics, it becomes possible to cluster learners with similar characteristics, which allows for tailored learning interventions. Therefore, the aim of the current study is to map the learner profiles in the ODL System at Anadolu University via using data mining methods and techniques. The study will be conducted utilizing data from approximately 30,000 learners pursuing associate and undergraduate degrees in the ODL System at Anadolu University during the 2018-2019 academic year. Analyses will be conducted utilizing data from various sources. The study seeks to investigate the most distinctive variables and propose the most successful algorithm in developing learner profiles that can be used in designing better suited courses. As a result of the analyses, the highest silhouette measure of cohesion and separation values were achieved via TwoStep algorithm and 3 distinct learner profiles were identified.

**Keywords:** learner profiles, segmentation, open and distance learning.

### 1. Introduction

The number of learners, and the diversity of learner profiles in return, have dramatically gone up in Open and Distance Learning (ODL) institutions as both the accessibility and affordances of information and communication technologies (ICT) have increased in the 21<sup>st</sup> century (Bates, 2015; Moore & Kearsley, 2011; Simonson et al., 2012). It has now become commonplace for learners with distinct demographic profiles, previous learning experiences, needs and interests to come together themselves within the same learning environments both formal and informal (Dwivedi & Bharadwaj, 2015). The diversification of learner profiles further complicates the decision-making processes for educational institutions in terms of key learning dynamics including learning processes and environments, and learner support systems. Therefore, it becomes

of paramount importance to determine distinct learner characteristics and map learner profiles so that academic decision-making processes are better informed, and the learner is situated in the centre of all learning activities. The determination of learner profiles will also contribute to the development of personalized and adaptive learning schemes (Bates, 2015; Graf & Kinshuk, 2013; Stöter, Bullen, Zawacki-Richter, & von Prümmer, 2014). The determination of learner profiles also enables to group learners sharing common characteristics together so that educational intervention tailored for each group of learners can be implemented.

Within this context, this study seeks to investigate the learner characteristics of learners enrolled in Introduction to Information Technologies I course taught through ODL at Anadolu University. The learners were randomly selected among the LMS users during the 2018-2019 academic term. Data belonging to a total of 26,667 learners were investigated. The cluster analysis yielded 3 distinct clusters.

## **2. Literature review**

The determination of learner profiles has the potential to not only develop further insights into learner behaviours but also provide learning opportunities better tailored for learners. The studies in the literature focusing on examining learner profiles primarily aims for personalization of learning through intelligent and adaptive learning systems. In addition, learner profiling studies also concentrate on improving learning quality and developing learner support and recommendation systems. Various data resources such as demographic characteristics, previous academic experiences, and LMS usage and navigation data have been utilized in determination of learner profiles. The profiling studies commonly make use of clustering and classification methods in profiling learners.

Learner profiling studies in the literature have been conducted using various data resources via different algorithms in various learning environments within the context of ODL. Yukselturk and Top (2013) determined learner profiles on an online course using learner entry characteristics, their engagement in the learning environment and course outcomes. In their study, they used TwoStep algorithm and detected 3 clusters. They concluded that learner entry characteristics and engagement behaviours are distinctive variables in determining learner profiles. Hogo (2010), on the other hand has attempted a comparative study using fuzzy cluster analysis to determine online learner profiles. This particular study suggests evolutionary methods to provide feedback for decision makers. The author used fuzzy cluster methods such as fuzzy c-means and core fuzzy c-means. In this study, web site usage data and data pertaining to learner online behaviours were utilized. This study concluded that fuzzy clustering serves better to determine learner behaviours compared to conventional clustering methods. The comparison of learners' real-life behaviours and results of the analysis yielded 78% match. However, unlike these studies Dwivedi and Bharadwaj (2015) investigated the problem of resource recommendation to groups of learners rather than individual online learners. They used data regarding learner learning styles, knowledge levels and resources utilized in profiling learners. For this study, collaboration-based filtering framework was offered to provide recommendation for learner groups using the integrated learner profiles developed in the study. The recommendation system developed in the study was compared to conventional recommendation systems and the recommendation system developed was found more successful empirically. The authors highlight the difficulty of bringing together the individual choices in recommendation systems aimed for groups and draw attention to the scarcity of recommendation systems for groups of learners in online learning. Other studies in the literature also focus on the dynamically updated learner profiles in adaptive online learning platforms and profiles detected are tested in different learning settings. Rezaei and Montazer (2016) grouped learners according to their personal characteristics, learning



behaviours and learning styles to tailor the services on the online adaptive learning system. They conducted 4 step clustering method using different algorithms together to compose learner groups. The authors offer a new adaptive learning system that can automatically generate learner groups. They concluded that the system offered could present important advancements in online learning in terms of academic satisfaction and progress. On the other hand, Premlatha, Dharani, and Geetha (2016) developed a dynamically updated learner profiling according to changing learner preferences and needs in adaptive online learning environments. Learner profiling parameters were defined through colourful Petri networks which facilitate each learners' learning path and can dynamically monitor learner behaviours and preferences. Learners profiles are automatically updated in case of a change in learner behaviours. This study was tested in two different adaptive online learning settings. The results revealed that learners found adaptive online course which utilized dynamic learner profiling more motivating and satisfactory. Bouchet, Harley, Trevors, and Azevedo (2013) grouped learners in an intelligent learning system according to their interactions and composed learner profiles. In determining the clusters, learners' exam, content upload, content usage and learning log data were used. Cluster analysis was conducted via Expectation Maximization algorithm was used and 3 learner profiles were generated. Clusters were analysed using multivariate statistical analysis and each variable used in the formation of clusters yielded statistically significant results.

Studies conducted in the field underscore the shortage of data and conclude that the utility of data from various data resources can result in more comprehensive and generalizable results (Amershi & Conati, 2009; Jovanovic, Vukicevic, Milovanovic, & Minovic, 2012; Yukselturk & Top, 2013). Unlike the studies in the literature, this particular study analyses data from a big learner population enrolled in various departments. Therefore, it is expected the generalizability of results should be higher.

### 3. Purpose

This study aims to investigate the learner characteristics of learners enrolled in Introduction to Information Technologies I course taught through ODL at Anadolu University during the 2018-2019 academic term.

### 4. Methods and procedures

Cluster analysis was used in this study to generate the learner groups. In cluster analysis, data is grouped according to similar characteristics. Cluster analysis hinges on the idea of detecting vectors that best represent data and recoding all data using into these new vectors (Han & Kamber, 2006). In clustering, low similarities between groups and high similarities within groups are aimed.

#### 4.1 Participants

The participants in this study are composed of 26,667 learners enrolled in Introduction to Information Technologies I course taught through ODL at Anadolu University during the 2018-2019 academic term.

#### 4.2. Data collection and analysis

Data for this study was accessed through the university student information system (SIS) and Anadolun eKampus LMS database. After the collection of data, features to be used in the cluster analysis. Features with low discriminatory power were detected via a recursive method and crossed out from analysis. The exploratory data analysis yielded the following features and types to be selected for cluster analysis (Table 1).

Table 1: The features used in the cluster analysis.

Features	Type of Feature
Course Access Count	Continuous



Course Materials Access Count	Continuous
Chapter Summary Access Count	Continuous
eBook Access Count	Continuous
Video Access Count	Continuous
Test Access Count	Continuous
Previous Exam Questions Access Count	Continuous
Diagnostic Test Access Count	Continuous
Average Academic Success Grades	Continuous
Gender	Nominal
Time Spent on the System (minute)	Continuous

After the features were determined, different clustering algorithms were tested. Since Silhouette measure of cohesion and separation was higher TwoStep algorithm was chosen. TwoStep algorithm is composed of two steps; pre-clustering and clustering. During the pre-clustering phase, a process similar to k-Means algorithm is applied and data is separated into sub clusters. In the second phase, subclusters determined in the pre-clustering phase are grouped according to the number of clusters calculated or determined by the user, and real clusters are generated (IBM, 2011). The cluster analysis applied using the features displayed in Table 1 utilized partitioned data and standardized numeric fields. At the end of the analysis, 5% of the units were detected as outliers and excluded from the analysis accordingly. Since the data in this dataset is both categorical and numerical, the Log-likelihood distance was chosen. IBM SPSS Modeler software was used in the study to apply the cluster analysis. The Modeler analysis image formed to determine the learner profiles is presented in Figure 1.

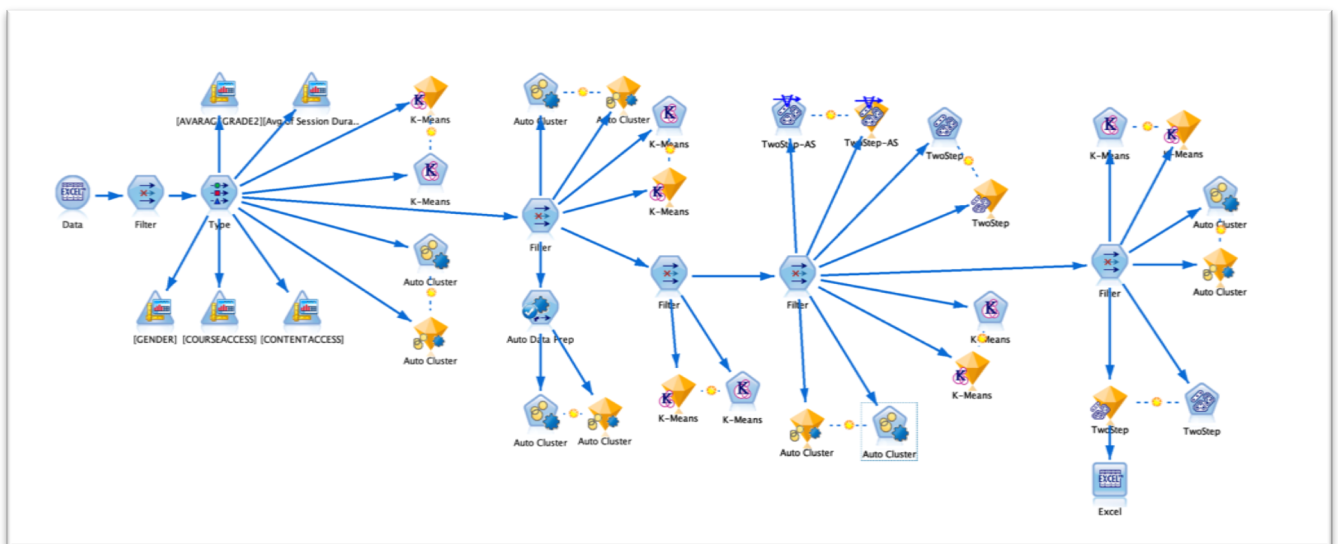


Figure 1: Modeler analysis image for the determination of learner profiles.

## 5. Results

In this study, data belonging to 26,667 was investigated to determine the learner characteristics of learners enrolled in Introduction to Information Technologies I course taught through ODL at Anadolu University during the 2018-2019 academic term. Also, cluster analysis was used to determine learner profiles from this dataset. At the end of the analysis, 5% of the units were detected as outliers and excluded from the analysis accordingly.

A total of 26,492 were left for cluster analysis. Three clusters were formed after the analysis. Silhouette measure of cohesion and separation was calculated as 0.44. Figure 2 displays the size of these clusters.

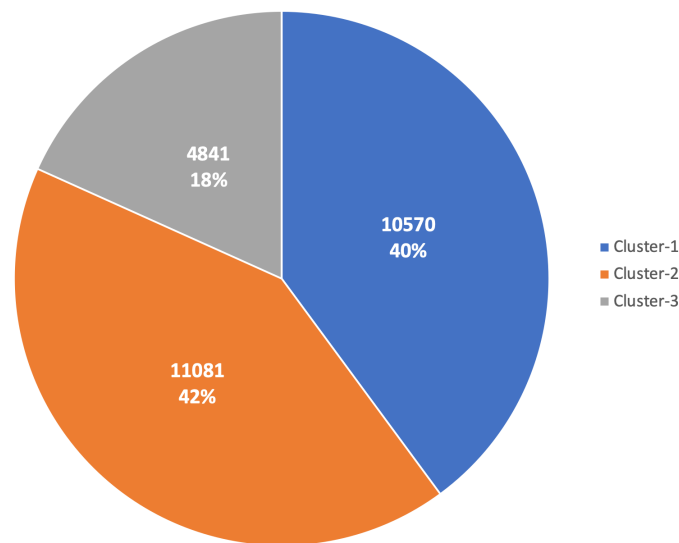


Figure 2: The size of the clusters obtained via cluster analysis.

Figure 2 demonstrates that the proportional distribution of the clusters, according to the number of units. The results revealed that the most distinctive features were course materials access, system access and gender. In addition, academic success was also included in the model as a distinctive feature. However, time spent on the system wasn't a distinctive feature and thus was excluded from the model. The general properties of the clusters achieved are as follows:

- **Cluster 1:** Cluster 1 is composed of 39.9% of the learners. This cluster includes 10,570 learners. The learners in this cluster accessed the online course 14 times and course materials 27 times on average during one semester. Furthermore, they accessed chapter summaries and eBooks 3 times on average. Also, they accessed previous exam questions 4 times, diagnostic tests once 1 and tests 3 times on average. The learners in this cluster viewed videos 7 times on average. All learners in this cluster are male and their average academic success grades is 54. Cluster 1 can be classified as Medium Level compared to the other two clusters in terms of academic success and course materials access counts.
- **Cluster 2:** Cluster 2 is composed of 41.8% of the learners. There are 11,081 learners in this cluster. The learners in this cluster accessed the online course for 9 times and course materials for 15 times during one semester on average. Moreover, they accessed chapter summaries and eBooks once on average. In addition, they accessed previous exam questions twice, diagnostic tests 0.5 times and tests 0.6 times on average. They also viewed videos 3 times on average during the semester. All learners in this cluster are female and their average academic success grades is 48. Cluster 2 can be classified as Low Level compared to the other two clusters in terms of academic success and course materials access counts.
- **Cluster 3:** Cluster 3 is composed of 18.3% of the learners. There are 4,841 learners in this cluster. The learners in this cluster accessed the online course 28 times and course materials 79 times on average. Besides, they accessed the chapter summaries and eBooks 9 times on average. Also, they accessed previous exam questions and tests 10 times each, diagnostic tests 3 times on average. They also viewed videos 28 times on average during the semester. 95% of the learners are female and the average academic success grade is 61. Cluster 3 can be classified as High Level compared to the other two clusters in terms of academic success and course materials access counts.

One-way ANOVA test was used to investigate whether the clusters significantly differed in terms of features used in cluster analysis. Since Levene Test didn't reveal homogeneity of variances ( $p < .05$ ), Brown-Forsythe statistic was used to make interpretations ( $p < .05$ ) (Pallant, 2011, p.253). the results are presented on Table 2.

Table 2: The investigation of features in terms of clusters.

Features	Cluster	n	$\bar{x}$	s	F	p
<b>Course Access</b>	Cluster-1	10570	13.64	13.92	2526.38	<b>&lt;.001</b>
	Cluster-2	11081	9.31	7.84		
	Cluster-3	4841	28.38	20.35		
<b>Content Access</b>	Cluster-1	10570	27.49	41.27	2235.47	<b>&lt;.001</b>
	Cluster-2	11081	14.70	22.56		
	Cluster-3	4841	78.86	78.31		
<b>Average Academic Success Grades</b>	Cluster-1	10570	54.12	22.65	752.42	<b>&lt;.001</b>
	Cluster-2	11081	47.81	21.33		
	Cluster-3	4841	61.15	18.07		
<b>Chapter Summary</b>	Cluster-1	10570	2.93	4.61	3138.63	<b>&lt;.001</b>
	Cluster-2	11081	1.06	2.02		
	Cluster-3	4841	8.59	7.50		
<b>eBook</b>	Cluster-1	10570	3.36	5.37	2363.15	<b>&lt;.001</b>
	Cluster-2	11081	1.40	2.36		
	Cluster-3	4841	9.42	9.37		
<b>Video</b>	Cluster-1	10570	7.08	25.88	566.30	<b>&lt;.001</b>
	Cluster-2	11081	2.81	11.22		
	Cluster-3	4841	28.05	64.93		
<b>Test</b>	Cluster-1	10570	2.73	5.68	2326.78	<b>&lt;.001</b>
	Cluster-2	11081	0.64	1.66		
	Cluster-3	4841	10.11	11.63		
<b>Previous Exam Questions</b>	Cluster-1	10570	3.42	6.66	1363.38	<b>&lt;.001</b>
	Cluster-2	11081	1.82	3.88		
	Cluster-3	4841	9.93	12.64		
<b>Diagnostic Test</b>	Cluster-1	10570	1.19	3.61	674.26	<b>&lt;.001</b>
	Cluster-2	11081	0.46	1.50		
	Cluster-3	4841	3.23	5.99		

Table 2 above displays that each associated feature shows significant differences in terms of clusters ( $p < .001$ ). When one-way ANOVA tests yield significant differences among groups, it increases the power of the interpretation of the results to examine between which groups the difference is significant. For this reason, the suitable multiple comparison tests (POST-HOC test) need to be utilized at this point (Büyüköztürk, 2017, p.49). Within this respect, Tamhane test results were investigated to find out which groups showed significant differences. According to the test results, each cluster demonstrated significant differences. In terms of course access, Cluster-1 had significant differences with and Cluster-2 (md: 4.33;  $p < .001$ ) and Cluster-3 (md: -14.74;  $p < .001$ ). Also, significant differences were found between Cluster-2 and Cluster-3 in terms of course access

(md: -19.07;  $p < .001$ ). As to the Content Access feature, Cluster-1 demonstrated significant differences with Cluster-2 (md: 12.78;  $p < .001$ ) and Cluster-3 (md: -51.36;  $p < .001$ ). In addition, Cluster-2 showed significant difference with Cluster-3 (md: -64.15;  $p < .001$ ). In terms of Average Academic Success Grade, Cluster-1 had significant differences with Cluster-2 (md: 6.30;  $p < .001$ ) and Cluster-3 (md: -7.03;  $p < .001$ ). Furthermore, Cluster-2 showed significant differences with Cluster-3 (md: -13.34;  $p < .001$ ). With regard to Chapter Summary usage, Cluster-1 demonstrated significant differences with Cluster-2 (md: 1.87;  $p < .001$ ) and Cluster-3 (md: -5.65;  $p < .001$ ). Besides, Cluster-2 and Cluster-3 had significant differences (md: -7.52;  $p < .001$ ). Concerning eBook usage, there were significant differences between Cluster-1 and Cluster-2 (md: 1.96;  $p < .001$ ) and Cluster-3 (md: -6.06;  $p < .001$ ). Also, there were significant differences between Cluster-2 and Cluster-3 (md: -8.02;  $p < .001$ ). As to the Video usage Cluster-1 showed significant differences with Cluster-2 (md: 4.26;  $p < .001$ ) and Cluster-3 (md: -20.97;  $p < .001$ ). There were also significant differences between Cluster-2 and Cluster-3 (md: -25.24;  $p < .001$ ). In terms of test usage Cluster-1 displayed significant differences with Cluster-2 (md: 2.09;  $p < .001$ ) and Cluster-3 (md: -7.37;  $p < .001$ ). Moreover, Cluster-2 had significant differences with Cluster-3 (md: -9.46;  $p < .001$ ). Regarding the Previous Exam Questions usage, Cluster-1 demonstrated significant differences with Cluster-2 (md: 1.60;  $p < .001$ ) and Cluster-3 (md: -6.50;  $p < .001$ ), and there were significant differences between Cluster-2 and Cluster-3 (md: -8.11;  $p < .001$ ). Finally, with regard to Diagnostic Test usage Cluster-1 showed significant differences with Cluster-2 (md: .73;  $p < .001$ ) and Cluster-3 (md: -2.04;  $p < .001$ ). Cluster-2 also significantly differed from Cluster-3 (md: -2.77;  $p < .001$ ).

Chi-square test was utilized to test significant differences in gender. Test results are given on Table 3.

Table 3: Chi-square test results.

Clusters		Gender		Total	$\chi^2$	df	p
		Male	Female				
Cluster – 1	n	10570	0	10570	25,507.04	2	<.001
	%	39.9%	0.0%	39.9%			
Cluster – 2	n	0	11081	11081			
	%	0.0%	41.8%	41.8%			
Cluster – 3	n	251	4590	4841			
	%	0.9%	17.3%	18.3%			
Total	n	10821	15671	26492			
	%	40.8%	59.2%	100.0%			

As demonstrated on Table 3, there were significant relationships between gender and cluster groups ( $\chi^2$ : 25,507.04; df: 2;  $p < .001$ ).

## 6. Conclusions

This study aimed to determine learner profiles studying at Open Education System at Anadolu University so that these distance learners can be better identified. The data belonged to randomly selected 26,667 learners enrolled in Introduction to Information Technologies I course during 2018-2019 academic year. Cluster analysis revealed 3 distinct learner profiles.

LMS access, learning resources usage and academic success grades of learners in Cluster 1, identified as Medium Level, were higher than those of learners in Cluster 2, coded as Low Level; however, lower than those

of learners in Cluster 3, coded as High Level. LMS access, learning resources usage and academic success grades of learners in Cluster 2 were the lowest among the three clusters, while Cluster 3 had the highest scores for the aforementioned features. Therefore, LMS access, course materials usage and academic success grades were found effective in generating learner profiles. In addition, gender also played a significant role in profile formation. On the other hand, contrary to the expectations time spent on LMS did not significantly contribute to formation of learner profiles in this study. The results of the study also revealed significant differences between learner profiles with regard to LMS and course resources utility, which was in line with the academic success grades of learners.

## 7. References

- Amershi, S., & Conati, C. (2009). Combining unsupervised and supervised classification to build user models for exploratory. *JEDM| Journal of Educational Data Mining*, 1(1), 18-71.
- Bates, A. W. 2015. "Teaching in a Digital Age: Guidelines for Teaching and Learning". <https://opentextbc.ca/teachinginadigitalage/>, Access date: 05 Ocak 2018.
- Bouchet, F., Harley, J. M., Trevors, G. J., & Azevedo, R. (2013). Clustering and profiling students according to their interactions with an intelligent tutoring system fostering self-regulated learning. *JEDM| Journal of Educational Data Mining*, 5(1), 104-146.
- Büyüköztürk, Ş. (2017). *Sosyal bilimler için veri analizi el kitabı*. Ankara: Pegem Akademi.
- Dwivedi, P., & Bharadwaj, K. K. (2015). e-Learning recommender system for a group of learners based on the unified learner profile approach. *Expert Systems*, 32(2), 264-276.
- Graf, S. (2013). Dynamic student modelling of learning styles for advanced adaptivity in learning management systems. *International Journal of Information Systems and Social Change (IJISSC)*, 4(1), 85-100.
- Han, J., & Kamber, M. (2006). *Data mining: concepts and techniques* (2nd ed.). San Francisco, CA: Morgan Kaufmann.
- Hogo, M. A. (2010). Evaluation of e-learners behaviour using different fuzzy clustering models: a comparative study. *International Journal of Computer Science and Information Security*, 7(2), 131-140.
- IBM. (2011). IBM SPSS Modeler 14.2 Algorithms Guide. Retrieved from <ftp://public.dhe.ibm.com/software/analytics/spss/documentation/modeler/14.2/en/AlgorithmsGuide.pdf>.
- Jovanovic, M., Vukicevic, M., Milovanovic, M., & Minovic, M. (2012). Using data mining on student behavior and cognitive style data for improving e-learning systems: a case study. *International Journal of Computational Intelligence Systems*, 5(3), 597-610.
- Moore, M. G., & Kearsley, G. (2011). *Distance education: A systems view of online learning* (3rd. ed.). Wadsworth: Cengage Learning.
- Pallant, J. (2011). *SPSS survival manual: A step by step guide to data analysis using SPSS* (4th ed.). New York: Open University Press.
- Premlatha, K. R., Dharani, B., & Geetha, T. V. (2016). Dynamic learner profiling and automatic learner classification for adaptive e-learning environment. *Interactive Learning Environments*, 24(6), 1054-1075.
- Rezaei, M. S., & Montazer, G. A. (2016). An automatic adaptive grouping of learners in an e-learning environment based on fuzzy grafting and snap-drift clustering. *International Journal of Technology Enhanced Learning*, 8(2), 169-186.
- Simonson, M., Smaldino, S., Albright, M., & Zvacek, S. M. (2012). *Teaching and learning at a distance: Foundations of distance education* (5th ed.). NY, Allyn & Bacon: Pearson Pub.

- Stöter, J., Bullen, M., Zawacki-Richter, O., & von Prümmer, C. (2014). From the back door into the mainstream: The characteristics of lifelong learners. In O. Zawacki-Richter & T. Anderson (Eds.), *Online distance education: Towards a research agenda*. Athabasca, Canada: Athabasca University Press.
- Yukselturk, E., & Top, E. (2013). Exploring the link among entry characteristics, participation behaviors and course outcomes of online learners: An examination of learner profile using cluster analysis. *British Journal of Educational Technology*, 44(5), 716-728.

## ON SYSTEMIC CHANGE IN UNIVERSITY EDUCATION

### ALFONSO HERRERO DE EGAÑA ESPINOSA DE LOS MONTEROS

UNED

alherrero@cee.uned.es

### Carmen Soria Bravo

UNED

csoria@madrid.uned.es

### Alberto Muñoz Cabanes

UNED

amunoz@cee.uned.es

#### Abstract

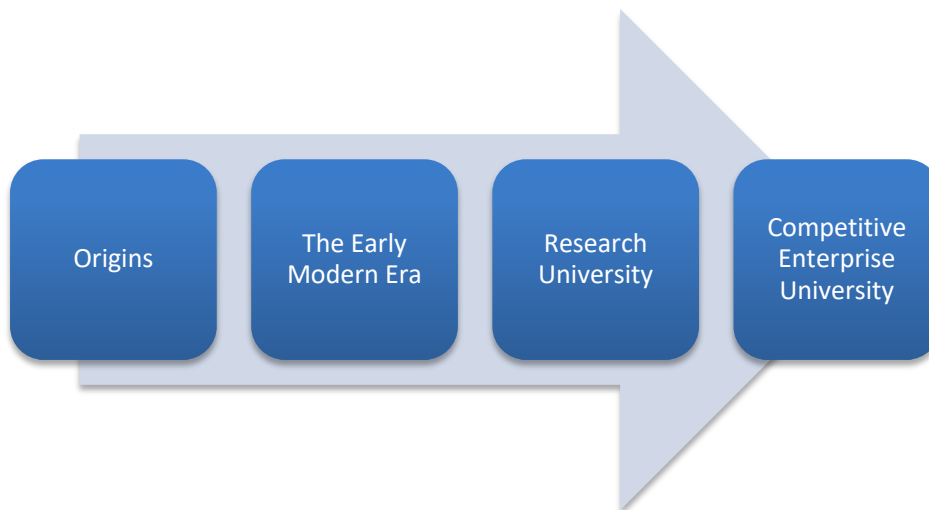
**The current university system is a result of several changes in response to different challenges that started in the early 1960s. The acquisition of new competencies for teachers is just another modification to permit the system to continue working correctly. Maybe changing the educational landscape is not a matter of piecemeal changes because a fundamental shift in one aspect requires significant changes in other elements for it to be successful and systemic change is a must.**

**Keywords:** systemic change, piecemeal change, education.

#### 1. Introduction (Calibri, 12 pt, bold)

University has evolved through four different phases, see Figure 1. Before their formal establishment, many medieval universities were run as Christian cathedral schools or monastic schools (Scholae Monasticae). The first universities Bologna Paris, Oxford, Cambridge, Salamanca, began as private corporations of teachers and their pupils.





*Figure 1. Evolution of higher Education*

It has been assumed (Grendler 2004) that the universities went into decline during the Renaissance; it is a fact that they played a crucial role in the Scientific Revolution of the 16th and 17th centuries. Copernicus, Galileo, Kepler, and Newton were all amazing university products of that time. However, it was not until the 19th century that the research university evolved, first in Germany and then elsewhere, redesigning the nature of the university worldwide (Altbach, Reisberg, and Rumbley 2009).

Becoming a competitive enterprise in the 21st century in which students compete for scarce places in top universities, and universities compete for status, ranking, and funding from governmental and private sources (Altbach, Reisberg, and Rumbley 2009).

## **2. Evolution of the Research Model**

Research model reflected Von Humboldt's vision of the unity of teaching and research (Bommel, Bas van 2015 and Menand, Louis; Reitter, Paul; Wellmon, Chad 2017). Knowledge should be formed based on logic, reason, and empiricism. For the underlying educational process of the university research model, see Figure 2.

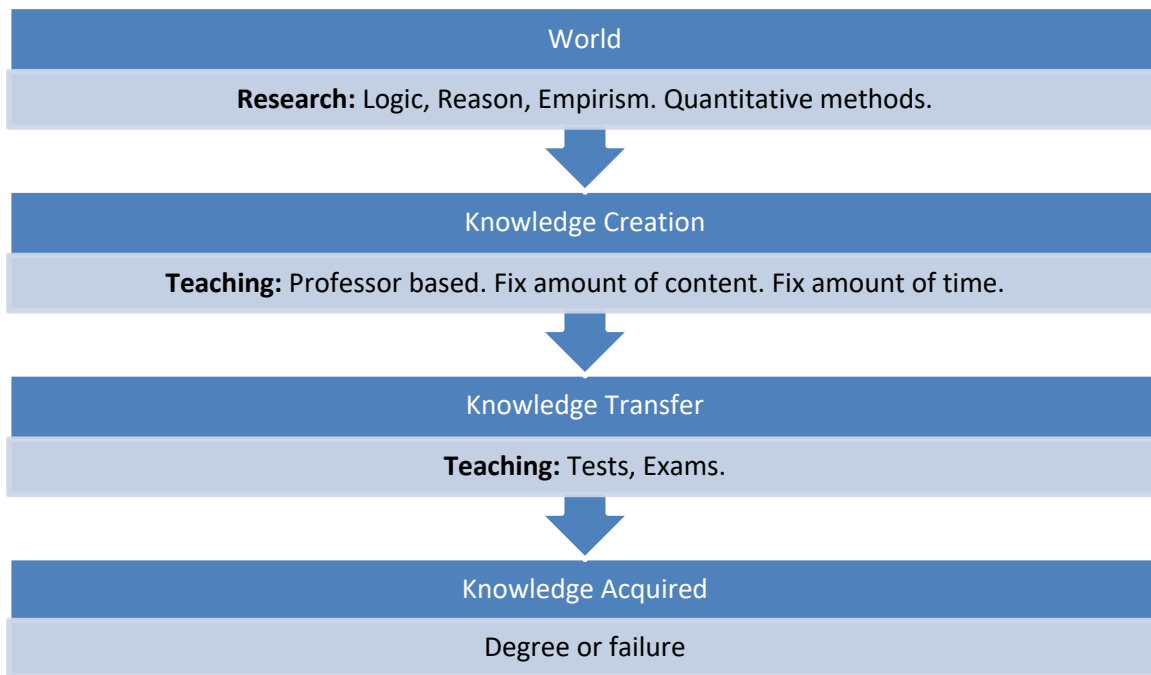


Figure 2. Basic educational process of the research model

Many reports argue that university has become a competitive enterprise, first because competition has always been a force in the academe, and also in response to the main engines of change of this era (Altbach, Reisberg, and Rumbley 2009). It is possible to distinguish three main forces that have affected the university. See figure 3.

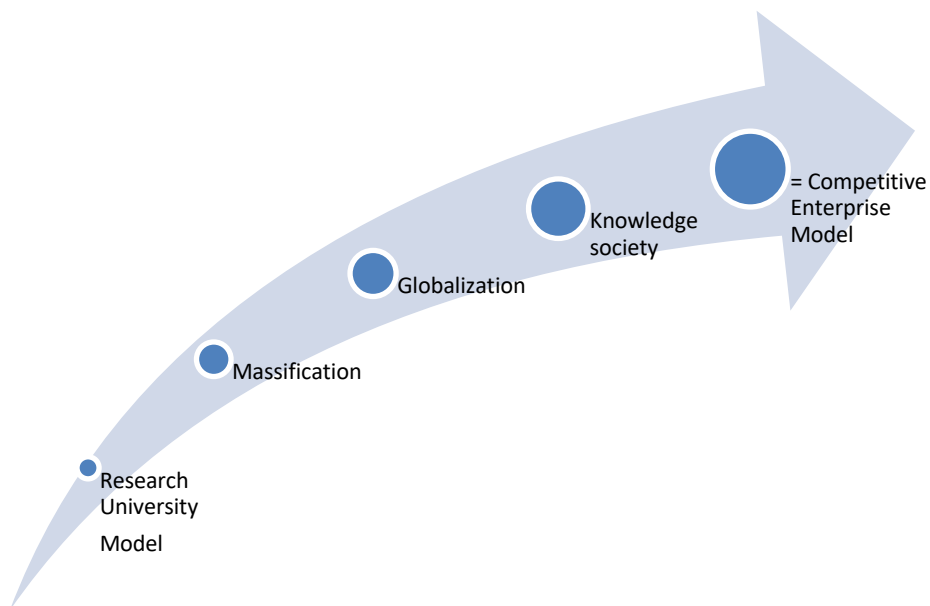


Figure 3. Evolution of University

The main engine of change in the 20th century has been massification, which should be considered in two different ways or stages. First, to cope with demand, the need for expanded infrastructure, and a more extensive teaching corp and then to deal with the implications of diversity.

A consequence of massification is that university professors do not have time to spend in research, and research is not only a matter of funds; it is also a process that goes inside the professor's minds. To research is to give answers to unresolved questions and time, and the will to research are other factors to consider. Massification attacked the base of the Research University model.

Another driving force of the university evolution has been globalization. The integration of the world economy, new information, and communications technology (ICT), the role of the English language, lead to the internationalization of universities. The approach to teaching and learning through distance-education programs and within the walls of traditional universities is another feature to take into consideration.

The third impulse of transformation is the knowledge society requirements. The third massification wave for the Higher Education system because politicians will send more and more people to the educational system expecting that university will solve the problems that markets and governments are unable to elucidate.

It is possible to justify the existence of an Entrepreneurial University model (Etzkowitz 2000) because nowadays, universities encompass the third mission of economic development in addition to their traditional purposes of research and teaching. See figure 4.

Figure 2 summarize the evolution. As a response to the increasing importance of the knowledge-based economy and the recognition that university is cost-effective, creative inventor and transfer agent of both knowledge and technology, it is possible to justify the existence of an Entrepreneurial University model (Etzkowitz 2000) because nowadays universities encompass the third mission of economic development in addition to their traditional purposes of research and teaching. See figure 4.

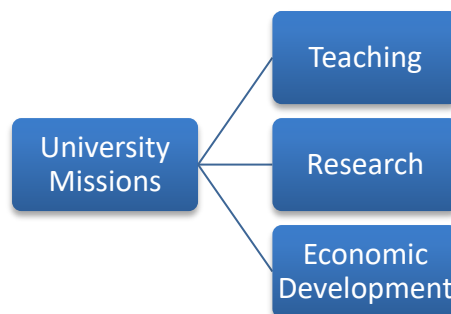


Figure 4. The Third Mission.

Universities may have added a new product, economic development, but that does not change the nature of the Competitive Enterprise Model; it is just a change in their business model. University is expected to produce not only graduates and knowledge but economic development, innovation, and technology. Besides, there are three significant shifts in the changing landscape of education to consider: the kind of future works demanded by society, the type of student that goes to university, and the disaggregation of university degrees.

Universities may have added a new product, economic development, but that does not change the nature of the Competitive Enterprise Model; it is just a change in their business model. University is expected to produce not only graduates and knowledge but economic development, innovation, and technology. Besides, there are

three significant shifts in the changing landscape of education to consider: the kind of future works demanded by society, the type of student that goes to university, and the disaggregation of university degrees.

According to the World Economic Forum, 65 percent of people entering college this year will be working in jobs that do not currently exist, so it is almost impossible to know or even imagine the kind of knowledge or skills those jobs will need. This fact will force actual workers to attend university in order to update their knowledge in the future, diminishing the proportion of 18-year-old full-time students (Mainland 2019).

The change in the traditional student of the university will force the disaggregation of university degrees because there will not exist a degree that will match the needs of the new kind of students. The need for students to become lifelong learners will turn in a change in the business model of Higher Education. The mix of students will also change the pedagogical landscape of education.

There are other business models based on organizational innovation, like Minerva University. Minerva's point is to get rid of costs that strangle higher education, like classroom facilities, tenure, and there is only one faculty for the different campuses around the world that will not be paid to do research (Herrero 2017).

There are indeed different business models at university, but the most significant prove and that university has become a competitive enterprise is the diminishing part of the spending that goes for instruction. The expenses in non-instructional staff, which includes administrators, Seven-figure CEOs, excellent facilities, and so, shows that the German Research Model has been loaded with the costs of the structure of the Modern Enterprise Model.

### **3. Conclusions**

The answer of the university to the forces of change has been piecemeal changes, fixing a part of it to permit the system to continue working correctly, leaving unchanged the primary educational scheme of the German Research Model.

One dilemma for research is the explosion of knowledge production outside the university within the business and other organizations, which poses a critical challenge to current modes of teaching and research within our universities and business schools (Gibbons 1994).

Changing the pedagogical landscape goes beyond the acquisition of new competencies for teachers. A resource-based instead of the professor-based system allowing time to vary for a fixed amount of knowledge will be essential features of the learning process.

Another critical question is that the contemporary European education policy, which narrowly understands education as a preparation for the labor market, arguing that we need to decide between McKinsey and Humboldt (Nida-Rumelin 2009).

Maybe systemic change, which entails replacing the whole thing, is the right answer to these questions because a fundamental change in one aspect requires fundamental changes in other aspects in order for it to be successful. This transformation will require to determine how it should be structured, what should be taught, and how it should be taught.

#### 4. References

- Altbach, Philip G., Reisberg, Liz, Rumbley, Laura E., Trends in Global Higher Education: Tracking an Academic Revolution A Report Prepared for the UNESCO 2009 World Conference on Higher Education Executive Summary. Page II.  
[http://www.cep.edu.rs/public/Altbach,\\_Reisberg,\\_Rumbley\\_Tracking\\_an\\_Academic\\_Revolution,\\_UNESCO\\_2009.pdf](http://www.cep.edu.rs/public/Altbach,_Reisberg,_Rumbley_Tracking_an_Academic_Revolution,_UNESCO_2009.pdf)
- Bommel, Bas van (2015). "Between 'Bildung' and 'Wissenschaft': The 19th-Century German Ideal of Scientific Education German Education and Science". *Europäische Geschichte Online*. Retrieved 2018-04-29.
- Etzkowitz,, H Andrew Webster, Christiane Gebhardt and Branca Regina Cantisano Terra, 2000, The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm, *Research Policy*, vol. 29, issue 2, 313-330.
- Grendler, Paul F., 2004, The Universities of the Renaissance and Reformation. *Renaissance Quarterly*. Vol. 57, No. 1, Spring, pp. 1-42.
- Gibbons. M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. 1994. *The new production of knowledge: The dynamics of science and research in contemporary societies*. London: Sage.
- Mainland, Nathalie,2019,3 Major Shifts in the Changing Landscape of Education. TechDigest.  
<https://edtechdigest.com/2019/03/14/3-major-shifts-in-the-changing-landscape-of-education/>
- Menand, Louis; Reitter, Paul; Wellmon, Chad (2017). "General Introduction". *The Rise of the Research University: A Sourcebook*. Chicago: University of Chicago Press. pp. 2–3. Archived from the original on 15 February 2017. Retrieved 25 January 2017.
- Nida-Rümelin, Julian (29 October 2009). "Bologna-Prozess: Die Chance zum Kompromiss ist da". *Die Zeit* (in German). Retrieved 29 November 2015.

Please note that the proceedings will be published under the Creative Commons Attribution 4.0 International License: <https://creativecommons.org/licenses/by/4.0/>

The Full paper should be uploaded in your Ex Ordo account. It should be submitted by **1 October 2019** latest.

## Postgraduate studies in a distance university. Profile of the master students in UNED (Spanish National University for Distance Learning)

### Dr. Gema Juberías Cáceres

Universidad Nacional de Educación a Distancia (UNED), Spain  
gjuberias@cee.uned.es

### Dr. Pablo de Diego Ángeles

Universidad Nacional de Educación a Distancia (UNED), Spain  
pdiego@der.uned.es

#### Abstract

Due to the insufficiency of the knowledge acquired by the student during the phase of studies of Bachelor, by definition more generalistic, it becomes necessary the emergence of the postgraduate studies.

Distance learning has been strongly introduced in the educational system due to the development of new technologies. On-line teaching allows flexibility for students study hours. The UNED students is very well Known for their ability for compatibilize their studies with professional/work tasks and family. For many of them it implies a complement to the training already acquired in other subjects, for others a second opportunity for a first university formation. Distance learning is specially relevant for people with disabilities, elite sports men and women, seniors or even persons deprived of liberty for criminal reasons.

UNED currently has 10,000 master level students. In total, 70 official masters and a large number of master's degrees in non-regulated teaching are offered. Especially relevant are the professional masters that allow access to the performance of a particular profession (clinical psychologist, lawyer, solicitor, etc.)

Only the distance learning technology of UNED allows those figures that in a conventional university would be unmanageable. UNED covers the entire national territory and has a wide presence abroad as well. The master student who arrives at UNED is required to know its peculiarities, its specific methodology and its tools that develop the competencies and necessary skills to study by distance independently.

Finally, we have to emphasize the fact that the authors belong, respectively, to the Dean's Office of the Faculties of Law and Economic and Business Administration of UNED. In those Faculties Bachelor degrees and postgraduate Studies in Law, Public Administrations, Social Work, Economics, Business Administration and Tourism are delivered.

**Keywords:** UNED, Distance learning, Postgraduate Studies,

## 1. Introduction

To speak about Masters, in the world of today, implies to refer to the European Higher Education Area. In June 1999, the Education Ministers of twenty-nine European countries met in Italy and signed the Bologna Declaration. At that time, the basis of a starting point of a process of convergence in the issue of education were set. This process developed progressively until 2010, the temporal horizon established in the own Bologna Declaration. The main target is to favour transparency between the different member states' educational systems benefiting students' mobility (and professors' as well).

The monitoring of the convergence process is done through periodic meetings, every two years, in different places (Prague 2001, Berlin 2003, Bergen 2005, London 2007, Louvain 2009). In the *Bologna Declaration* these biannual phases are previewed, each one concluding with a conference of the Higher Education ministers. During this period, the achievements are reviewed setting new performance directions and concrete policies and measures are adopted in order to construct the European Higher Education Area.

Among these measures there is the establishment of the European Credit Transfer System (ECTS). The European Credit is conceived as the unit of measure of the academic asset in official university studies. It represents the amount of work of the student to accomplish the syllabus aims. In conclusion, the European Credit guarantees the convergence of the different European higher education programmes.

The construction process of the EEES also includes the adoption of a flexible degree system, comprehensible and comparable, that promotes new job opportunities for the students. The application of the ECTS implies, on one hand, a previous and necessary condition to fix the new degrees. On the other hand, it is necessary to establish grading systems for the students which are easily comparable and which allow to calculate, for each subject, the student's success rate. On this matter, the student's grade reveals the achieved learning level and it reflects on their academic record along with the grade distribution percentage of the mark over the students who are pursuing the subject in the same year.

In the new degree system, the total amount of credits per year is sixty. The minimum number of hours per credit equals twenty- five, and the maximum, thirty. In the credit allocation to each one of the subjects conforming the syllabus, the amount of working hours required for the acquisition by the students of the pertinent knowledge, capacities and skills'' (article 4.3 of the Royal Decree 1125/2003, of September the 5<sup>th</sup>, setting the European Credit System and the degrees grading system in the official university degrees nationwide). In this assignment, it will be taken into account:

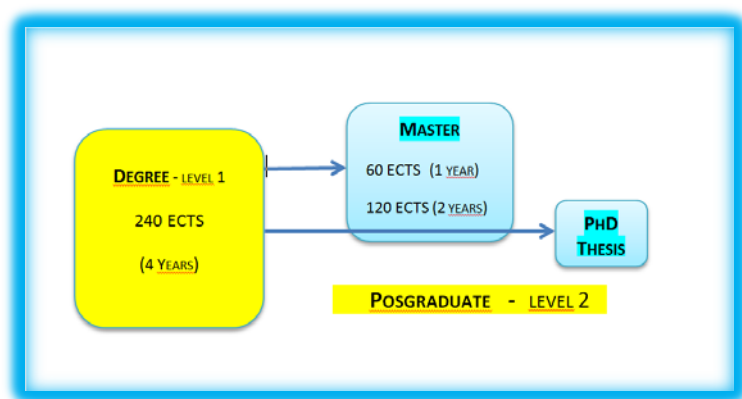
- The amount of (theoretical and practical)school hours
- Study hours
- Hours dedicated to papers, practices or projects
- Required hours to prepare exams and evaluation tests.
- Hours invested on doing the exams and evaluation tests



Anyway, the implementation of the new degrees must respect the (professional and academic) rights, given to those who are graduates according to the previous system. The point is for the new degrees to have a flexible design, taking into account each one's scientific and academic singularities. It is intended that the new degrees do not disturb the finalisation of the previous ones, disappearing soon, and that during the time they coexist, they do it harmonically.

In Spain the *Ley Orgánica (Organic Law) 6/2001* of December the 21<sup>st</sup>, of *Universities*, following the authorization given to the Government in its article 88.2, tells the Government to adopt the necessary measures for the positive integration of the Spanish system in the European Higher Education Area. The European credit system and the grading system in the official degrees, with validity nationwide, was introduced in Spain through the Royal Decree (Real Decreto) 1125/2003 of September the 5<sup>th</sup> (BOE number 224, September the 18<sup>th</sup>). Following what the article 149.1.3<sup>a</sup> of the Spanish Constitution establishes, the Central Government has the exclusive competence over the rule of the conditions to obtain academic and professional degrees. That is why the Royal Decree (Real Decreto) 55/2005 of January the 21<sup>st</sup> was published, the structure of University degrees was fixed and the official degrees were ruled (BOE number 21 of January the 25<sup>th</sup>).

The new degree system is based on two levels: Grade and Postgraduate, whose structure consists on three cycles, as we observe in Diagram 1:



**Diagram 1: EHEA Structure.** Source: own

The first level (degree) comprehends the first cycle University studies. The second level (Postgraduate), comprehends the second and third cycle's studies.

Related to the Postgraduate Studies, the article 8 of the related Royal Decree ( Real Decreto) says:

1. "The second cycle of the undergraduate studies will be dedicated to advanced, specialized or multidisciplinary training, addressing an academic or professional specialization or to promote the initiation in Research duties. The overcoming of the cycle will give the right to obtain the Master qualification.
2. The third cycle of the college studies pursues the advanced training of the student in Researching techniques, it could include courses, seminars or other activities, intending the research training and will include the making and presentation of the pertinent Thesis, consisting on an original research work. The overcoming of this cycle gives the

right to obtain the Ph. D. qualification, which represents the highest education level, and gives credit to the highest academic rank and allows the teaching and research according to current legislation.

3. The official postgraduate studies will require by a specific regulation (*reglamento*) development.

The regulation development will be done by the Royal Decree (Real Decreto) 56/2005 of January the 21<sup>st</sup>, that regulates the official Postgraduate studies (BOE number 21 of January the 25<sup>th</sup>). The Royal Decree (Real Decreto) aims to fix the legal framework that allows the Spanish universities to structure, with flexibility and autonomy, their official Postgraduate studies, to harmonize them with the ones in the European and World level. Therefore, the Master qualification has been developed along with the Ph. D degree.

The new law does not impose general directions but it bets on flexibility, favouring collaboration between same-university departments (belonging to the same Faculty/School or to different Faculties/Schools), and even between different universities (national or foreign).

This fact is especially relevant in the core of distance-learning universities. That is the case of the Universidad Nacional de Educación a Distancia (UNED) to which the authors belong.

On the other hand, in the case of degrees who allow to develop professional activities, it is previewed that the Government establishes the conditions to which the syllabus must adapt in order to guarantee that the qualifications give credit to the acquisition of the necessary knowledge to practice the pertinent profession. That is what the article 8.3 of the Royal Decree (Real Decreto) 56/2005, of January the 21<sup>st</sup> and the article 15.4 of the Royal Decree (Real Decreto) 1393/2007 of October the 29<sup>th</sup> establish.

To conclude with the current valid legislation, we will point out that the Royal Decree (Real Decreto) 1393/2007 of October the 29<sup>th</sup> has been later modified by the Real Decreto 861/2010, of July the 2<sup>nd</sup> (BOE number 161 of July the 3<sup>rd</sup>), in order to introduce the necessary settings so as to guarantee and bigger fluency and efficacy in the established criteria and procedures by the referred Royal Decree (Real Decreto) 1393/2007, of October the 29<sup>th</sup>, through the Royal Decree(Real Decreto) 43/2015 of February the 2<sup>nd</sup> (BOE number 29 of February the 3<sup>rd</sup>)

## **2. Postgraduate studies in Spanish National University for Distance Learning (UNED)**

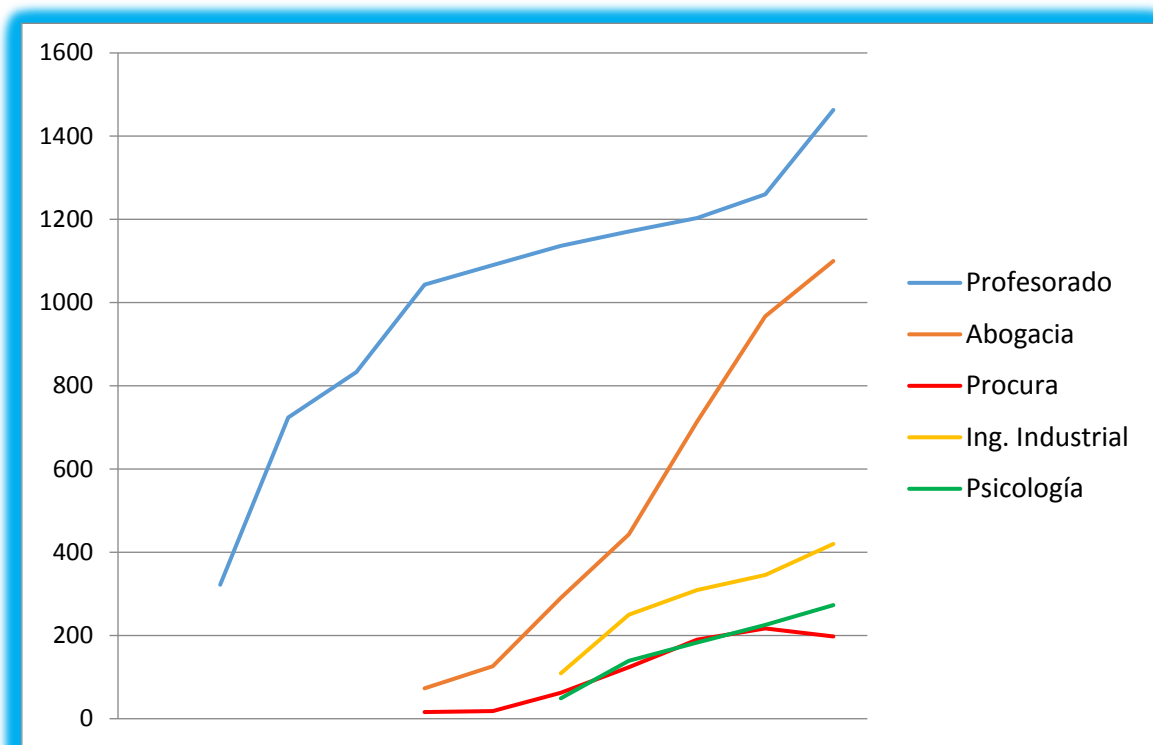
During the academic year, 2019-2020 UNED offers 76 official masters. The amount of registered students in the overall of offered masters follows an uprising trend, growing every time, especially since 2015. The data of the number of enrolled students are the following:

- 7872 students in 2015
- 9335 students in 2016
- 8836 students in 2017
- 9342 students in 2018
- 10000 students in 2019

Based on great fields of Knowledge, we would like to highlight the 37 masters in Social and Legal Sciences (field of knowledge that engulfs the degrees of Education, Law, Economics, Political

Science and Sociology). In that list, we should highlight the Master in Gender studies, with a big demand today. There are 15 masters in Art and Humanities (Geography, Philology and Philosophy), 4 in Sciences (of that Faculty), 7 in Health Science (including Psychology, Sciences and Sanitary Administration, this one imparted by the Economics Department of the Law Faculty and we should also add the Master in Social Intervention Psychology, new for 2020). Finally, there are 13 masters in Architecture and engineering (proposing two new ones for 2020 in 1) Cybersecurity and 2) Engineering and Data Science).

CURSO	Profesorado	Abogacia	Procura	Ing. Industrial	Psicología
2009					
2010	322				
2011	724				
2012	833				
2013	1043	73	16		
2014	1090	126	18		
2015	1136	290	62	109	49
2016	1171	443	124	250	139
2017	1203	714	190	309	183
2018	1260	967	217	345	225
2019	1463	1100	198	420	273



**Diagram 2; UNED main Masters Registry figures and evolution 2010-2020**

“Profesorado” is for Master in Training of Teachers of Secondary Education; “Abogacia” is University Master in Access to Legal profession; “Procura” is for Master in access to Deputyship,

that allows to become a Deputy of the Courts; **Ing.Industrial is for** University Master in Industry Engineering; **"Psicología" is for** University Master in General Sanitary Psychology

The Masters can be classified, as we have seen before, on one hand, in International and Inter-university Masters. On the other hand, regarding the master's professional condition, we can distinguish between the masters that allow practicing certain ruled professions (professionalising masters and the Research Masters themselves.

- International Masters: We must highlight the ones developed with European Agencies (such as FRONTEX and CEPOL) They are both a consequence of the agreement in Postgraduate training issues UNED and Guardia Civil have kept for the last thirty years. UNED gives its qualification to both masters. In the first case-FRONTEX- another four European universities (Salamanca among them) also give the degree, that is, five universities give that ensemble degree. In CEPOL, only UNED gives the title. In both masters a year of 25 to 30 students has already graduated and the second year is about to graduate in June-September 2019 with similar figures (in both masters). We should not forget there is another international master between UNED and *Plovdisky Universitet* in Bulgary in Electronic Systems of Information and Communication, obviously belonging to the technical and technological world of information (where UNED leads in many aspects).
- The Interuniversity masters (we have already named some) are those who are developed and imparted in two or more universities, usually with ensemble qualification. We can name, among them, for their importance, the following ones:
  - 2.1 Agro- environmental and Agricultural-food Sciences (UNED-UAM)
  - 2.2 Sustainability and Corporative Social Responsibility (UNED-UJI)
  - 2.3 Research in Culture Law (UNED-UC3M)
  - 2.4 Systems and Control Engineering (UNED-UCM)<sup>1</sup>

Professionalizing Masters: Among them, the following ones outstand for their importance in terms of enrolled students:

1. Master in Training of Teachers of Secondary Education, whose exact name is University Master in ESO (the Spanish for Compulsory Secondary Education), and Bachillerato (the Spanish pre-university educational stage), professional training and language teaching. It is a Master addressed to professionals of education to be allowed to practice their profession in Secondary Education according to the directions and requirements of the ORDEN ECI 3858/2007, of December the 27<sup>th</sup>, and to the Royal Decree (Real Decreto) 1834/2008 of November the 8<sup>th</sup> and that, during the year 2018-2019, has had 1474 students. The previous years' registrations (from 2015 to 2018, left to right, appear in the diagram)
2. The University Master in Access to Legal profession. This Master allows to do the Ministry of Justice's exam to practice the profession of Lawyer (this is quite recent for the old graduates could straight access the profession). In 2019, this Master has 1128

---

<sup>1</sup> UAB stands for Barcelona Autonomous University, UAM stands for Madrid's Autonomous University, UCM stands for Madrid's Complutense, UC3M stands for University Charles the III in Madrid, UJI stands for Jaume I in Castellon. Finally, UAH stands for University of Alcalá de Henares.

students. The previous years of registration (from 2015 until 2018, left to right, is displayed in the following Diagram)

3. Master in access to Deputyship, that allows to become a Deputy of the Courts (once the candidate has passed the exam of the Ministry of Justice), which has had 218 registered students in 2019. Accomplishing the Access Law, and according to the Regulation's Preface, the main target of these Masters is to improve the professional skills of the Lawyers and Deputies to be, as relevant Justice Administration collaborators, so as to guarantee citizens have an assistance and a good legal defence as core elements to exert the fundamental right to an effective judgemental protection (article 24 of the Spanish Constitution) (inalienable principle, a consequence of the division of powers). That training should be carried obeying the non-discrimination and universal accessibility principles. This requirement of the Access Law Regulation connects with another one of the main targets of both masters, which is to incise and deepen in the fundamental training in values that must be given to any students who intends to develop their professional future in any area of legal activity, and, in this case in the Law and Deputyship, through the permanent sensitivity in the profession's ethical and deontological values.
4. The University Master in Industry Engineering that has had 441 students during the year 2018-2019. The enrolment in previous years (from 2015 until 2018, left to right is as follows). It is an official qualification imparted by the Superior Technical School of Industrial Engineers of UNED and it was assigned to the field of knowledge named: "*Engineering and Architecture*". It started its delivery in the year 2014/2015 and the teaching modality is fully distance learning. In addition, the proposed degree qualifies for the practice of the profession of Industrial Engineer, according to the *Orden* (Ministry rule) CIN/311/2009. The student can choose among the eight offered specialities, covering the most important fields of knowledge in the Industrial Engineering from the scientific point of view as well as from the technological point of view. The 120 ECTS of the Master (necessary to get the qualification) split in two years, 60 ECTS each. In those credits they include theoretical and practical training in basic aspects of the knowledge branch of industrial engineering (in its different aspects), in common subjects and in subjects of different itinerary, as well as external practices, seminars, conducted works, doing exams, Final Project Dissertation and other training activities.
5. The university Master in General Sanitary Psychology has had in 2019 and for the period 2019-2021 115 students in a number that distributes the places by provinces. The enrolment of previous years (from 2015 to 2018, from left to right) is as showed in the diagram. This Master gives access to the regulated sanitary profession named *General Sanitary Psychologist*, as it appears in the *Ley 33/2011 General de Salud Pública* (the Spanish Law for Public Health). In its *disposición adicional séptima* (seventh annexed rule) it describes the activities this profession can develop (related to the effective practice of Psychology): "*it is to the General Sanitary Psychologist the research, evaluations and psychological interventions on those behaviour issues and activity of people that influence in the promotion and improvement of their health's general condition, as long as those activities do not require an specialized attention by other sanitary professionals*". Psychologists owning a title of the UNED's Master in General Sanitary Psychology will be allowed to develop their professional activity for hire in the

sanitary field and to inscribe their office (or psychological assisting units) in the General Registry of centres, services and sanitary establishments. Nevertheless, only the psychologists possessing the degree as a Clinical Psychology Specialist will be able to practice their job in the *Sistema Nacional de Salud* (the Spanish National System of Health) and other concerted health centres.

### **3. Profile of master students in Spanish National University for Distance Learning (UNED)**

The Masters UNED offers are characterized by the fact that they are specially designed for distance learning students. Nowadays, due to the advance of new technologies, traditional obstacles for not face-to-face learning are gone. Virtual communications make differences between face-to-face and distance learning clearly go unattended.

The UNED student chooses our university to complete their degree studies knowing the benefits distance learning gives them. Schedule flexibility and easiness to juggle studies, labour, and family responsibilities are positively valued aspects for those who decide to study any of the UNED masters.

The student of UNED frantically learns "their way". Study planning, more autonomous and flexible in distance learning, is no doubt one of the most attractive advantages for students.

People in special situations with a disability or imprisoned have a special consideration in our university. UNED has a specific assisting section for disabled students (UNIDIS). The Students Vicerrectorado (the subordinate to the Vice-chancellor) has created an area for inmates with the Spanish Authorities of this area (Ministry of Interior).

On the other side, people overseas, elite sportsmen and soldiers in special detachments, can also find a chance to study and train themselves in our university in any of the offered study programmes.

The study guides of the subjects of each Master are a basic tool. They are conceived as a starting point in the student's learning process. They contain general information related to contents, learning targets, illustrative planning, learning methods, evaluation process, etc. Once the student has formalized the pertinent registration, they access the "virtual courses" through which more precise and detailed information related to the study of the subject is proportioned.

Nevertheless, the "distance learning" student is not alone. The teaching team of the subject takes over answering questions and consults of the students. In Degree Studies in UNED, the head teacher's role is fundamental, primarily in first year subjects. However, in Master studies, the teaching team of the subject develops the head teacher's role.

Moreover, in general education, and specifically in distance learning modality, the intervention of a mentor is of great relevance. The mentoring process aims to accommodate and accompany the new students during the Master. The person who practices this labour is usually a student that has already coursed the Master, or at least has already started it, who has a specific training to do this job. Mentoring is a relationship of help between a mentor and another one with less experience, aiming to make easier and to develop skills, knowledge, confidence and socialization of the mentored, increasing its success probabilities. We speak of eMentoring in the case communication between the student and the mentor is done through telematics (computerized). The students who turn to mentoring service receives support and accompaniment during the first year.

More specifically, the university master in personal orientation, the eMentorship Programme pursues the accommodation and orientation of new students regarding their needs related to:

- Fitting in the university life
- Access to academic information
- Achieving academic success: self-regulated distance learning strategies
- Time management
- Master requirements and features
- Previous general competencies in the usage of TIC
- Use of available resources
- Motivation to study and to face obstacles that could arise

UNED'S motto "wherever you are" reflects very well the own characteristics of our students. In UNED, there are no barriers to study. UNED offers many chances for those who really want to face the price-challenge of learning and studying

#### **4. CONCLUSIONS**

**UNED** development is still growing, especially in the Postgraduate Studies area. The number of students and the quality of the Master degrees in UNED, mainly in the Masters for professional purposes, shows the growth in the last years and there is nothing that we can consider a change in the tendency. However, **UNED** must be aware of the student preferences and the most recent technological tools to implement.

This study should be continued in the area of the other Masters (not only the professional ones) and perhaps we can obtain different conclusions due to the different motivation of the students in both types of Master studies

Madrid, 30<sup>th</sup> of September 2019

[gjuberias@cee.uned.es](mailto:gjuberias@cee.uned.es)

[pdiego@der.uned.es](mailto:pdiego@der.uned.es)



## Short Learning Programmes (SLP) for Professional Development: results from an international collaborative experience (UAb-UNESP)

### Glória Bastos

Universidade Aberta, Portugal  
gloria.bastos@uab.pt

### Ana Novo

Universidade Aberta, Portugal  
anovo@uab.pt

### Helen Casarin

UNESP, Brasil  
helen.casarin@gmail.com

### Abstract

In this paper we intend to describe and reflect on the process and results concerning the collaborative work between Universidade Aberta (UAb, Portugal) and Universidade Estadual Paulista (UNESP, Brasil) for structuring and implementing a SLP for the professional development of higher education librarians.

The course structure involved teachers of the two mentioned institutions, looking for covering current and mandatory subjects needed for the 21st century information professional, who must be aware of the developments related to the access and dissemination of scientific knowledge. The main topics covered were: Open educational resources; Open Science; Information ethics; Skills in the use of technologies applied to online and distance teaching and learning environments.

Taking advantage of online and digital education, and based on UAb's Virtual Pedagogical Model, we were able to put in contact the librarians from the different campuses of the libraries of UNESP, in a context of interaction and collaboration that allowed participants to acquire mutual knowledge of the practices within the same institution. In fact, the challenges posed by continuing professional development, require that these programmes have a close relationship with real work contexts.

During the development of the course it was also possible for each participant to build a personal portfolio and a proposal of practical application of the themes and contents that were being discussed applying a problem-based learning methodology. The design of the course, based on collaboration and interaction, allowed therefore the building of a virtual learning and practice community. Digital environments where the course took place ended up serving two functions and presented a double challenge: on the one hand served as a collaborative workspace between participants, but also allowed the development of their competences to act in that same digital context.

**Keywords:** SLP, e-learning, international cooperation, professional development, information science, UAb, UNESP

## **1. Introduction**

The digital contexts in which information professionals operate require skills that enable them not only to respond to the challenges of the knowledge society, but also to the needs of increasingly demanding information service users. In this context, the role of university libraries is not only to provide access to quality information, but to enable the user community to use information optimally for knowledge building, quality research and impact science production.

The development of training activities for the university community, particularly undergraduate and postgraduate students, on the use of information resources available in the library, standardization of scientific work and searching databases, usually on demand, is part of the librarians' routine. However, in the scenario of major transformations and innovation in teaching and student profile, the librarian has his/her role expanded, requiring him/her to prepare courses on different platforms, addressing content that enables the search, use of information to autonomously build knowledge of students, anticipating the difficulties and requests arising from the adoption of a more active and collaborative teaching.

In addition, teachers themselves also need to deal with increasingly sophisticated tools for searching, storing, disseminating and publishing research, including ethical, copyright, and metric issues for evaluating sources and channels for publication, not to mention preparation of learning objects. Thus, once again, there is an important area for librarians to prepare teaching materials and conduct courses in different modalities to meet and anticipate the needs of the university community.

Training processes should therefore respond to these requirements, but in the case of active professionals, the need for flexible training environments is a requirement. At the same time, the sharing of knowledge and good practice should be encouraged to enrich the institutions involved.

So, we had to take into account that we were dealing with mature students that differ from other student profiles in terms of responsibilities in their daily lives, motivations and expectations. All this aspects influences their learning experience (Cercone, 2008; Gravani, 2015), so there is a need for an educational environment where they can determine their own learning pathways, share their ideas and sustain their educational process simultaneously with their private and professional life. Thus, the online distance education environment offers them the right opportunities and means.

In this context, a Short Learning Program (SLP) on Information Science was developed for 20 active librarians, belonging to the various campuses of Universidade Estadual Paulista (UNESP), using the e-learning modality and according to the guidelines of the Virtual Pedagogical Model of Universidade Aberta of Portugal (UAb). The UAb applies its own pedagogical model, certified by prestigious international organizations in the area. This model is based on four fundamental pillars: student-centered learning, the primacy of flexibility, the primacy of interaction, and the principle of digital inclusion (Pereira et al., 2007, p. 10). This model has been framing the design of the UAb courses, giving conceptual and functional support to new training, while taking into account the changes taking place in the field of higher education and, in particular, distance education (Quintas-Mendes et al., 2018).

## **2. SLP: international cooperation for professional development**

In recent years, UAb has made a considerable effort regarding the development of more flexible modes of learning provision. This effort materializes through the design of courses with different durations, focused on specific learning needs identified in society. In the context of continuing education, these SLP take also into account the notion of situated pedagogy, i.e., they have a strong connection with real-world situations and with professional and social contexts, creating links to existing experiences and aiming at an active intervention by students/participants.

We know that adult learners who are self-directed and highly motivated, bring a wealth of life and experience to the learning environment, and look to use current knowledge from courses immediately in their work environments. So, in the context of continuing education we are also talking about "expansive" learning environments (Hodkinson & Hodkinson, 2005), where the participants find close collaborative work, colleagues mutually supportive in enhancing learning and in some circumstances the opportunity to consolidate a professional identity. It is now recognized that these elements are also critical in a successful online learning experience. They are key elements to motivation and satisfaction, and a possible link to course completion and attainment of stated learning outcomes.

Concerning the challenges posed by continuing professional learning, SLP require a close relationship with society and different kind of organizations, to build a "just in time" and "just enough" learning roadmap for trainees. It is important that courses designed to improve professionals' practice establishes congruent relations with workplace settings. The proposals of Hodkinson & Hodkinson (2005) for teacher training can be also applied to the context of librarians continuing professional development. The authors conceptualised learning as both individual and contextual, and mentioned that off-site courses can be valuable in enabling contact and collaboration with others in related but different working situations.

UAb and UNESP have a long academic relationship but this SLP was the first experience in building a joint formative offer. The option for a SLP arose because, in general, formal degrees are more difficult to build together since different national regulations can put unexpected barriers to those kind of programmes. SLP are more flexible concerning time schedule and curricular design. In this sense, they present a wide range of possibilities namely for building programmes in partnership.

According to the report of a survey on good practices in SLP in Europe (Maina, Guardia & Albert, 2018), one of the outstanding trends in SLP is collaboration between more than one institution, including in different countries, as is the experience reported here in which UAb and UNESP jointly developed the proposed training for librarians.

### **3. The case of a SLP on Information Science**

#### **3.1 Context**

UNESP is a public university, maintained by the Government of the State of São Paulo (Brazil) and has the characteristic of being multicampi distributed in 24 cities located in different regions of the state, including the capital and interior. It offers 136 undergraduate courses and 149 postgraduate programs in different areas of knowledge. Since 2017, UNESP, with a network of 33 libraries, has sought to innovate its structure and practices, with a view to changing student profiles and the intense use of technologies, as well as seeking to improve the quality of teaching.

In its Management Plan for 2017-2021, the current rector proposes to "Revitalize and reconceptualize the library space according to contemporary trends, turning it into a learning and living center, including support for the development of practices, teaching, pedagogical and / or technological innovations." (Valentini & Nobre, 2016, p. 15)

It is important to emphasize that libraries should be actively integrated into the activities offered by university courses, in particular those based on active learning methodologies. Thus, librarians need to improve their training in relation to pedagogical aspects.

### 3.2 Objectives and curriculum plan

Given the specific context and needs identified, the course objectives were oriented to the fact that the university library should play an innovative role and be constantly aware of the evolution brought about by technologies. These issues imply developing in students (in this case UNESP librarians) skills that allow them to act appropriately in digital contexts, namely in the field of information literacy and the ethical use of information.

The course aimed to enable librarians to plan and implement training activities for the university community in line with the current technology-intensive students' profile. It was intended to reflect on ways to increase student autonomy as well as how to develop collaborative work with teachers to more broadly meet the needs of the various users.

The course design involved teachers from both institutions, UAb and UNESP, seeking to cover current and necessary themes for the 21st century information professional, looking at the developments related to the access and dissemination of scientific knowledge. Key topics covered were Open Educational Resources, Open science, Information ethics, Competences in the use of technologies applied to the situation of distance education and learning.

The course proposal is in line with the Society of College, National and University Libraries (2017) *Mapping the Future* document, which considers five key strategic lines of library contribution: the use of big data and digital artifacts in research; flexibility and application of technologies in the teaching-learning process; focus on offering services rather than collections; lower boundaries between professionals and greater mutual collaboration; meeting new political, social and economic demands for higher education. On the other hand, the American Library Association (ALA) established in 2008 the standards for trainers that set which knowledge and skills librarians should develop, related to the teaching and learning process, which is not foreseen in the curricula of Brazilian library courses (Mata et al., 2016).

Bearing in mind that the participants in the course were active working professionals, the course was designed to deepen the aforementioned themes in view of the challenges of today's society and in a contextualized reflection paradigm about the profession. These aspects are particularly valued in the context of the continuing education of the group of information professionals, as it is commonly recognized the urgency of professional updating in an area such as Information Science, bearing in mind the rapid changes that have been taking place. In addition, the offering of the distance learning course provided the in service training of librarians and allowed them to experience the use of appropriate tools for hybrid and distance learning, according to the current educational trends.

This course was designed to instruct the librarians on how to perform their educational function in an optimized and efficient manner, in line with the educational trends that are present in current higher education and that have been adopted by UNESP. The knowledge of techniques and strategies of active learning methodologies by librarians contributes to the potential of these processes, both for students and teachers, as well as situations of joint work of teachers and librarians in the educational field.

### 3.3 Course methodologies

Regarding the methodologies developed, it was intended to make full use of the potential of e-learning. The "virtual classroom" allowed us to bring in contact professionals from different UNESP library campuses, in a context of interaction and collaboration that allowed participants to have a mutual knowledge of practices within the same institution, an aspect that was somewhat dissipated, as can be seen in their initial comments. This dimension was valued both during the training, in the forum discussions, and in the final reflection made by the participants and which will be analyzed in the results chapter.

In fact, it was sought that the virtual learning environment (which took place at LMS Moodle) and which is the preferred means of work for the establishment of teacher-student(s) and student-student relationships(s), would facilitate the study and discussion of contents, stimulate reflective autonomy and collaborative participation, both of which are fundamental pedagogical dimensions for today's distance education (Anderson & Dron, 2011). The work strategies most used in the course, such as forum discussion and group tasks (using wiki, blog and other tools), favor individual and joint reflection, leading to the desired participatory construction of knowledge, which helps to consolidate the learning community.

The course developed was also based on the construction of a personal portfolio and on proposals for the practical application of the themes and contents that were being debated, in a problem-based learning methodology approach. Participants were invited to analyze and identify contexts that need intervention in their areas of expertise and to look for ways to respond to these needs.

#### **4. Results discussion**

This study took a qualitative and an interpretive approach "attempting to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Denzin & Lincoln, 2005, p. 3). The complexity of the students' personal experiences offers interesting insights concerning the role of SLP in professional development and the value of online distance learning in that context.

The data were collected from a final written document where participants were invited to comment about the proposed contents and activities, the skills and knowledge acquired and the virtual environment in which the SLP was implemented. We illustrate the most relevant topics with examples of participant comments, which help us to better understand the scope and impact of this training.

##### *Course contents and activities*

The course content most commonly referred to by participants as being unfamiliar to them or about which they had not much knowledge, focused on Open Educational Resources and Creative Commons licenses. The various comments analyzed make it clear that participants greatly appreciated the fact that they had given access to diverse information about these Resources and that this new knowledge would be very useful to them in their professional daily activity.

*The OERs were a great discovery, I was surprised by the immense availability of this type of material and delighted that I could also produce contents with it. Another very important aspect addressed in this module was about the Creative Commons licenses, which I did not know about and will also integrate into the training I will provide to my students. (MEVP)*

*Open Educational Resources - I didn't know about these resources and learning about the use of licensed materials [Creative Commons] was extremely important along with the topic of information ethics, which is something we always deal with students here. (MF)*

Information ethics, copyright and academic integrity were also identified as interesting topics and considered indispensable for helping to form autonomous users and conscious and responsible citizens.

*We librarians perform many tasks on a daily basis, whether in the field of reference services or technical processing, and this routine experience almost automatically makes us leave a more focused orientation to users on the ethical use of information in the academic environment as we are restricted to quoting / plagiarism issues. This theme made me think of strategies for working with students. (KL)*

The reflections also contained multiple references to the fact that various web 2.0 tools were presented, such as padlet and e-portfolio, which for some were unknown and for others had not yet been exploited to their full potential.

*Although I work, study, use and live in Web 2.0, I confess that I didn't know much of the 2.0 tools presented in the third module and every information I receive adds me a lot as a person and as a professional, both for the development of my activities and - even more - as a "marketing" librarian for information skills development. (MEVP)*

*With regard to prior knowledge and personal empowerment, at the end of this journey I feel better able to develop a virtual environment course using (and challenging my users to use) the most diverse Web 2.0 resources that are openly and democratically available to anyone in order to increase the offer of new services in the library. (CAM)*

#### *Developed competences*

The trainees mentioned various skills that they had the opportunity to develop throughout the course and which they considered to be the most useful for their career path. Among the most cited we find the incentive for creativity and networking.

*The topics covered in the course are fundamental for us to develop the necessary skills to act as mediators between information and the user in order to enable him / her to identify and use the various sources of information and services provided by the Library which are linked to information and communication technologies. (TRV)*

The elaboration of a project of a course on Information Literacy, as well as the possibility of structuring initiatives that promote the development of students' Information Literacy skills were pointed out by several librarians as one of the advantages of this course.

*Developing a tutorial for working on information skills with higher education students has shown that we will take time to create it, but by the end it will always be available for users to consult, ask questions, and be more autonomous, allowing librarians to focus on other tasks. (KL)*

*[The course] strongly contributes to our education and enables us to take actions so that library users are able to identify their needs, search for relevant sources of information, select them, synthesize them, evaluate and apply them. (TRV)*

All education systems, including university libraries, should aim for students to acquire knowledge and skills to understand the world in which they live in order to become adults capable of actively intervening in society. Thus it is justified that one of the priority goals is to develop in students skills to learn how to learn and increase their autonomy. Students should be able to learn in order to mobilize all their personal and intellectual resources to research, analyze, compare, classify, summarize and evaluate information, i.e. building knowledge. In this context, the role and responsibility of the library and university librarians are increasingly valued. These ideas are well summarized in the following comments:

*The ability to learn how to learn must be developed by us and taught to users who come to us so that we all can contribute to the formation and development of conscious and active citizens. (MMO)*



*All the readings and activities proposed in each module, further reinforced the importance of the active role of libraries / librarians in the teaching / learning process, not only as disseminators and facilitators in access to information in any medium (print, digital, audiovisual, etc.) but also as encouraging and educating towards the use of information resources. (VS)*

Participants in the course were unanimous in considering that attendance at this training provided them with a considerable increase in knowledge on the various themes developed and referred in particular to Information Literacy. As an example we present the following comments:

*Participating in this course addressing information literacy has broadened my horizon regarding my own literacy and the responsibility I have as a librarian in the daily development of my library assignments. (MMO)*

*I consider that with the experience gained in the Information Literacy and Innovation course I am able to create a course for the users of my library with higher quality that will better achieve the teaching objectives of Information Literacy raised by my unit and our users. (AF)*

Another evolution felt by the majority of the librarians was the fact that this course allowed the theoretical knowledge that they already had and the one they had now acquired to be put into practice through the activities and challenges that were being suggested throughout the course, as evidenced by this librarian,

*It was very important being able to design an OER, especially having to be careful to use and find content registered with Creative Commons licenses that would allow to use the type of content you were designing. Until then I only knew the theory, doing the practical project raised my knowledge to a higher level. (AF)*

#### *Community building*

Sharing information within the UNESP network, among the 20 librarians, was considered an excellent added value given the opportunity to exchange ideas, experiences and good practices developed in libraries that, although physically distant from each other, belong to the same higher education institution.

*The possibility of developing activities and programs in network, considering that this class is formed by librarians covering almost the whole state of São Paulo was also very enriching. We are physically distant but we can keep close in the development of our libraries, as the focus should be of better assisting students of the UNESP Network, sharing experiences and developing proposals in the network. After all, librarians can and should overcome the traditional routine activities. (MMO)*

*I hope that in the future I will be able to maintain a knowledge network of projects and applications of literacy practices or informational competencies of UNESP libraries as well as sharing the needs and fulfillment of demands of our users, new and traditional student profiles, acting like a community. (LA)*

#### *Online learning and course design*

The format of the course and the fact that it is offered online and at a distance has shown to the librarians the benefits of this kind of training, encouraging them to take a proactive approach to online training, including thinking of designing courses with these characteristics for their own users. Thus, they expressed the need to be more flexible and open to change.



*As I read the suggested texts and performed the proposed activities, I began to see how important it is that we librarians need to be proactive in facing the new training scenarios - online - and the role of the university library with them – that is, to be more flexible and open to change. (MO)*

As a less positive aspect, some trainees referred their own time constraints that did not allow them to follow the topics and the discussion forums and challenges as they would have liked. Some also mentioned that the timeframe provided for each theme was not sufficient for a thorough and careful reading of the suggested texts and the timely and reflected participation in the forums,

*My expectation was that this module [module 1] would go beyond ethics in the Librarian profession, encompassing all aspects of academic integrity, including fake news. We do not have time, during the work, to discuss about this subject and it is extremely relevant for the education of our users. (LR)*

#### *Suggestions for future SLP*

Some aspects for improvement were suggested by the librarians, and these relate, for example, to the temporal distribution of themes and the inclusion of other subjects.

*I would also like to have seen other aspects that would address other pillars of competence such as identifying information needs and especially assessing users' competencies. (LR)*

In conclusion, the balance is undoubtedly positive, with the various participants expressing their satisfaction with the frequency of this training. According to their comments, they have acquired new personal, professional and academic competencies.

*Finally, a formation that made my eyes shine in terms of its form of development, the focus on the autonomy of the individual and the creative interaction developed via virtual / digital means, inspiring me to present / develop proposals for training sessions. (JPAC)*

*I would like to finalize the reflection by sending my deep thanks to the course's teachers and others involved in this partnership between UAb de Portugal and UNESP for the opportunity, the conviviality and all the benefits achieved. (AF)*

## **5. Final remarks**

The design of the analyzed SLP, based on collaboration and interaction, made it possible to build a virtual learning and practice community, as it brought together professionals from the same institution, but geographically dispersed across the various campuses. The digital environments in which the course took place ended up fulfilling two functions and constituting a double challenge, recognized and valued by the participants in the final appreciation of the course: on the one hand they served as collaborative workspaces between the participants, but also allowed to develop their skills to act in this same digital context.

We think that in the context of continuing education it is also important to allow different kind of publics to upgrade their skills and knowledge in new learning formats. Online distance education gives adult students the advantage of lifelong learning due to its flexibility. And flexibility, student centred learning and interaction are three major principles of UAb's Virtual Pedagogical Model.

Strengthening the vision of a learning society and lifelong learning in online contexts also fosters the use of tools that are essential for digital citizenship and also increases professional confidence particularly in

professional settings where digital environments are increasingly taking place (Novo, Bastos and Vasconcelos, 2016). This last aspect was seen as a very important one by this specific group of librarians. Taking into account the concept of Social Presence, defined by Garrison and Anderson (2003) as "the ability of participants in a community of inquiry to project themselves socially and emotionally as 'real' people (p. 28)", this learning context based on conversational settings helped participants to build knowledge, sharing experiences and practices, but has also contributed, in this particular case, to consolidate a professional and institutional identity.

Finally, it is important to mention that the articulation achieved between the two institutions involved in this training project launches good perspectives for future joint work and reveals the potential of SLP in online contexts for building partnerships to develop training that respond to people's concrete needs.

## 6. References

- Anderson, T., & Dron, J. (2011). Three Generations of Distance Education Pedagogy. *The International Review of Research in Open and Distributed Learning*, 12 (3). <http://www.irrodl.org/index.php/irrodl/article/view/890/1663>
- Bastos, G, Sequeira, R.M., Barros, D.M.V. (2019). O papel da educação online na formação de adultos: o caso da Universidade Aberta. *Revista Lusófona de Educação*, 45, 89-102.
- Cercone, K. (2008). Characteristics of Adult Learners with Implications for Online Learning Design. *AACE Journal*, 16(2), 137-159. <https://www.learntechlib.org/primary/p/24286>
- Denzin, N. K., & Lincoln, Y. S. (2005). Introduction. In N. K. Denzin & Y. S. Lincoln (Eds.), *The Sage handbook of qualitative research* (3rd ed., pp. 1-32). Thousand Oaks, CA: Sage.
- Garrison, D. R., & Anderson, T. (2003). *E-Learning in the 21st Century*. London: Routledge.
- Gravani, M. N. (2015). Adult learning in a distance education context: theoretical and methodological challenges. *International Journal of Lifelong Education*, 34(2), 172-193, DOI: 10.1080/02601370.2014.982728
- Hodkinson, H. & Hodkinson, P. (2005) Improving schoolteachers' workplace learning. *Research Papers in Education*, 20(2), 109–31.
- Maina, M., Guàrdia, L. & Albert, S. (2019). Good practices in European Short Learning Programmes (p. 6-8). In G. Ubachs (ed.). *The Envisioning Report for Empowering Universities*. Maastricht, NL: EADTU. <https://tinyurl.com/envisioning-report-2019>
- Mata, M. L. da; Casarin, H. de C. S.; Marzal, M. Á. (2016). A competência informacional como disciplina curricular na formação de bibliotecários na Espanha e no Brasil. *Anales de Documentación*, 19, 1-15.
- Novo, A., Bastos, G. & Vasconcelos, A. I. (2016). Effects of a virtual learning environment on librarian's information literacy and digital literacy competences. S. Kurbanoglu, J. Boustany, S. Špiranec, E. Grassian, D. Mizrahi & L. Roy (Eds.). *Information Literacy: Key to an Inclusive Society*, Springer. DOI: 10.1007/978-3-319-52162-6
- Pereira, A., Quintas-Mendes, A., Morgado, L., Amante, L. & Bidarra, J. (2007). *Modelo pedagógico virtual da Universidade Aberta: para uma universidade do futuro*. Lisboa: Universidade Aberta. <https://repositorioaberto.uab.pt/handle/10400.2/1295>

Quintas-Mendes, A., Bastos, G., Aires, L. L., Amante,L.; Cardoso, T. (2018). *Virtual Pedagogical Model. Development Scenarios*. Lisboa: Universidade Aberta. [https://portal.uab.pt/colecao-mpv\\_inovacao/](https://portal.uab.pt/colecao-mpv_inovacao/)

Stephen Pinfield, S., Cox, A. & Rutter, S. (2017). *Mapping the Future of Academic Libraries. A Report for SCONUL*. Society of College, National & University Libraries. <https://sconul.ac.uk/publication/mapping-the-future-of-academic-libraries>

Valentini, S. R.; Nobre, S. R. (2016). *Inovadora, sustentável e participativa: renovação com planejamento. Plano de gestão de 2017-2021*. São Paulo. <https://www2.unesp.br/portal#!/secgeral/eleicoes/concluidas/2016/>

## Students' feelings in social and collaborative learning: two case studies

### Jake Hilliard

Institute of Educational Technology, The Open University, Milton Keynes, MK7 6AA, UK.  
Jake.Hilliard@open.ac.uk

### Jon Rosewell

School of Computing & Communications, The Open University, Milton Keynes, MK7 6AA, UK.  
Jon.Rosewell@open.ac.uk

### Karen Kear

School of Computing & Communications, The Open University, Milton Keynes, MK7 6AA, UK.  
Karen.Kear@open.ac.uk

### Helen Donelan

School of Computing & Communications, The Open University, Milton Keynes, MK7 6AA, UK.  
Helen.Donelan@open.ac.uk

### Caroline Heaney

School of Education, Childhood, Youth and Sport, The Open University, Milton Keynes, MK7 6AA, UK.  
Caroline.Heaney@open.ac.uk

## 1. Abstract

In HE institutions within Europe and beyond, there is considerable interest in adopting collaborative approaches to online learning. These approaches give students opportunities to learn from each other as they study online, and also to develop their employability skills in working with others. Many educators are therefore keen to adopt these new methods in their courses; however not all students are enthusiastic about them. For example, students may be anxious about the prospect of taking part in online collaborative learning activities, particularly if they do not know the other students, and if their grades are dependent upon the success of the collaboration.

Research has shown that students experience a range of different feelings in relation to online collaborative learning. Some feelings (such as anxiety or frustration) may be a largely negative experience, while others (such as a sense of achievement or enjoyment) are largely positive. Recent research has shown that the effects of these different emotions on students' engagement and success are not as obvious as might be assumed.

This paper presents two case studies focussed on modules from the UK Open University (UK OU) which have integrated collaborative activities: the first is a 9-month undergraduate module on Information Technology (TM255); the second is a short non-accredited module on Digital Photography (TG089). The paper considers students' feelings about the collaborative activities and how feelings change from before they start, to during the collaboration, and finally after the activities have finished. The findings are used to identify how educators can best support their students in undertaking online collaboration with confidence and maximising the benefits gained.

## 2. Introduction

In recent years, the adoption of social and collaborative learning activities in online learning environments has become increasingly more prevalent in HE institutions (Järvelä et al., 2015). These activities are aimed at encouraging active learning by creating opportunities for students to interact with one another and share their experiences, skills and knowledge. The skills and competencies that can be developed from these social learning experiences (e.g. teamwork, creative and critical thinking, and collaboration) are highly valued by employers and are viewed as essential for working in the 21<sup>st</sup> century 'knowledge age' (Binkley, Erstad, Herman, Raizen, & Ripley, 2012; Harasim, 2017).

In an ideal scenario, online social and collaborative learning activities would involve students constructing shared knowledge and understanding, and ultimately accomplishing something (as a group) which is superior to that which could be achieved by one individual alone. Throughout the activity, not only would learners be fully committed to joint goals and the coordination of different perspectives, but they would also: be fully engaged in the activity; be respectful and appreciative of each other's contributions; feel confident in providing and receiving constructive feedback; and would all feel valued by one another. Students would experience positive feelings and emotions (such as curiosity, enjoyment and a sense of belonging) from taking part in the activity and would be highly satisfied with its outcome.

Unfortunately, online social and collaborative learning does not always generate such positive and pleasant feelings in learners. Personality clashes, differences in goals and priorities, challenges with commitment and time, worries about communicating with strangers online, and self-doubts over levels of knowledge are all examples of challenges that may disrupt online collaboration and learning. These challenges may increase conflict, reduce group cohesion, lower participation levels and lead to increased levels of negative feelings (such as frustration, anxiety, and disappointment) experienced by learners.

## 3. Review of literature

Over the past two decades, much interest has been given to how students feel and the emotions they experience when learning (Pekrun, Muis, Frenzel, & Goetz, 2018). Research over this period has highlighted the inextricable links between a learners' emotions and their cognitive processes (such as memory, attention and perception) (Tyng, Amin, Saad, & Malik, 2017). This has led to an increased awareness of the importance of emotions for student learning and academic achievement (Boekaerts & Pekrun, 2016). The terms *emotion* and *feeling* are often used interchangeably to refer to the same psychological phenomenon (Linnenbrink, 2006). Emotion can be defined as a relatively short-lived intense reaction in response to a particular object or event (Artino, Holmboe, & Durning, 2012). Emotions are thought to be multifaceted, consisting of affective, cognitive, physiological, motivational, and expressive components (Pekrun et al., 2018). The affective component here refers to the subjective feelings an individual may experience in relation to a specific object or event. For example, before undertaking an exam a student may report feeling anxious and worried. This subjective cognitive representation described by the student reflects the unique mental and physical changes experienced in this particular situation (Scherer, 2005). As Scherer (2005, p.699) states, feelings reflect '...the total pattern of cognitive appraisal as well as motivational and somatic response patterning that underlies the subjective experience of an emotional episode'. Exploring the single affective component of emotion is most frequently used by researchers to explore the emotional state of individuals. For instance, much research has involved asking participants to tick or rate (usually on

a type of Likert scale) the emotions they have experienced in a specific situation from a list of emotional states, or alternatively asking participants to describe their emotional feelings more freely in interviews or surveys (Scherer, 2005). In this paper, the use of the term emotion will refer to the single affective component described above.

Interest in the affective and emotional aspects of online learning has significantly increased over the past decade. For instance, during this period highly ranked journals (such as *The Internet and Higher Education* and *Learning and Instruction*) have published special issues on the role of emotions in online and computer supported academic learning environments (Artino, 2012; Mayer, in press). Much of this work has focussed on individual learning situations rather than social and collaborative elements of online learning. However, with the pedagogical shifts in teaching and learning, and a greater emphasis being placed on social elements of online learning, more research is starting to focus on the role of emotions in online collaborative learning settings.

In these learning environments, research has found that emotions are prevalent, with learners experiencing a wide range of positive emotions (such as *curiosity*, *enjoyment* and *excitement*) and negative emotions (such as *frustration*, *anxiety*, and *disappointment*). In a recent study, Reis et al (2018) reviewed the existing literature exploring the emotions experienced in online collaborative learning. From the 58 papers reviewed, 17 listed emotions and 44 terms were used to describe the discrete emotions experienced in computer supported collaborative learning environments. The most frequently mentioned emotions were *frustration* and *fear*, and other emotions frequently mentioned included: *anger*, *relaxation*, *boredom*, and *anxiety*.

As with much emotion research in academic settings, a number of studies have used retrospective research designs to explore affect in social and collaborative online learning. Hilliard, Kear, Donelan, & Heaney (in press) specifically investigated *anxiety* experienced by adult learners undertaking an assessed, online, collaborative project at the UK OU. Survey and interview data revealed that this emotion was commonly experienced by many learners before and during the project. Capdeferro & Romero (2012) also found high levels of *frustration* experienced by adult learners undertaking online collaborative activities on a master's degree course. Prospective research designs have also been used to explore student emotion in online collaborative settings. Hilliard, Kear, Donelan, & Heaney (2019) used a structured online diary to explore the emotions of adult distance learners at six time points during the group activity (once before, four times during, and once after). Results revealed fluctuations in positive and negative emotions throughout the activity. Feelings of *satisfaction* and *relief* were the most reported positive emotions and feelings of *anxiety* and *frustration* were the most frequently reported negative emotions. Webster (2019) used an emotion awareness and regulation tool during an in-class computer supported collaborative learning session to explore the emotions experienced by learners at three time points (at the beginning, mid-point and end of the activity). It was found that students reported more positive than negative emotions at all three time-points. Overall, feelings of *confidence* and *optimism* were the most commonly reported positive emotions whilst feelings of *anxiety* and *stress* were the most frequently reported negative emotions.

Although the reviewed studies highlight the prevalence of emotions in social and collaborative online learning, gaining a greater understanding of the broad range of emotions that are experienced and how these emotions change over time is vitally important to fully understand students' experiences of working collaboratively online. Furthermore, the exploration of adult distance learners' emotions

is currently scarce, and it is thought the emotional experiences of these students may be vastly different to those who study at face-to-face universities. For example, many distance learners are in full-time or part-time employment, and are geographically dispersed from other students.

#### 4. Aims and research questions

The main purpose of this study was to explore students' feelings when undertaking social and collaborative learning activities in two UK OU modules. The following research questions were addressed:

1. What positive and negative feelings do students experience in relation to social and collaborative learning activities in two different UK OU modules?
2. How do students' feelings change from before they start the collaborative activities, to during the collaboration, and finally after the activities have finished?

#### 5. The case studies

Two case studies are presented in this paper. For each study, a brief description of the study context, samples used, methods and findings are described first. A discussion of the findings of both studies is then presented.

##### 5.1 Case study: developing a website in a collaborative group project

###### 5.1.1 Context and methods

The first case study was undertaken with students from the module: TM255 'Communication and Information Technologies' at the UK OU. This is a second-year undergraduate module that lasts for 9 months. The study was undertaken with students studying from October 2018 to June 2019. As part of the module, students are required to work in groups of between 6 and 8 to undertake an 8-week group project. This predominantly involves: 1) producing a website for a specific 'client' (e.g. a family-friendly hotel); 2) sketching out further interactive aspects of the website; and 3) evaluating another group's work (website and annotated sketch) (see Figure 1). To carry out the project, groups are provided with various online tools: a forum for group discussion; and WordPress for the website development. A student's overall grade for the project is made up of both individual and group marks.

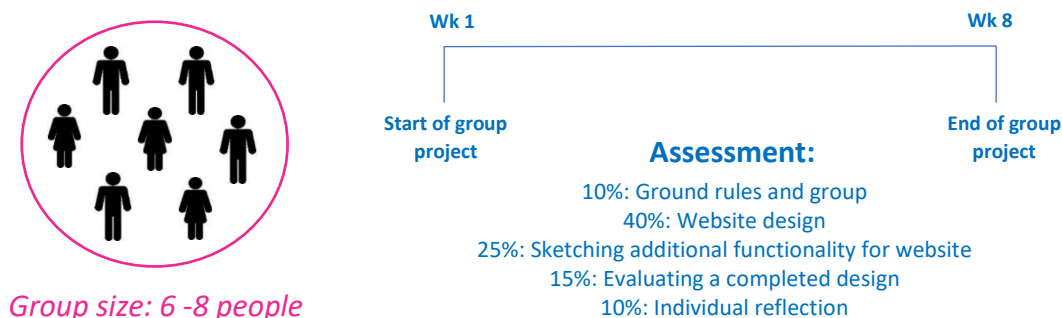


Figure 1: An overview of the TM255 group project.

This study used a prospective longitudinal design (Menard, 2008), where open-ended diaries (qualitative data) were completed by participants throughout the group project. For participating in the study, students received a £50 Amazon voucher.



After gaining ethical approval from the OU Human Research Ethics Committee (HREC/3028) and Student Research Project Panel SRPP (2018/101), an invitation email stating the purpose of the study and what would be involved was sent to 151 students studying TM255. From these, 22 students responded indicating their willingness to take part. Two students failed to complete the diary entries and were therefore withdrawn from the study. The 20 participants that completed this study ranged in age from 24 years to 56 years ( $M = 32.10$  years,  $SD = 7.79$  years), and the majority were male (75%). The age range was representative of the student cohort, but men were slightly under-represented as the proportion studying the module was 83%.

Open-ended diaries were used for students to describe how they felt whilst undertaking the collaborative project. Diaries were created using a Microsoft Word document that was shared with participants via Microsoft OneDrive. This enabled both the participant and researcher to view the diary throughout the study. Students were instructed on how to fill out the diary entries after agreeing to take part. Although participants could make diary entries at any time, there were four compulsory diary entries that were to be completed at specific time points; once at the beginning of the activity, once in the middle, once near the end, and once one month after the project had been completed. For each of these, participants had a 5-day period to write their entries. To help direct students with the types of things they should write about, prompts were provided at the start of each entry. For example, it was suggested that students could write about the emotions they had experienced, what caused these feelings, and whether students thought these had impacted on their participation and performance. Reminder emails were sent to participants before each of the four diary entries were to be completed. In total, all 80 diary entries were successfully filled out (100% completion rate).

Qualitative data from the online diaries were analysed using word count analysis (Leech & Onwuegbuzie, 2008). This process involved reading and re-reading the qualitative data to become familiar with the content and identifying emotion-related words before data were systematically worked through and emotion-related words counted. To ensure the data is not misleading about the emotions experienced by participants, only emotion-related words which expressed how the participants were feeling themselves during the diary entry period were coded. For instance, words used to describe the following were not counted: 1) emotions participants thought other students might be experiencing; 2) emotions they had experienced at a different time in the project (e.g. if a student discussed the emotions they had experienced at the start of the project in their final diary entry); 3) emotions they felt they may experience in future online collaborative activities; and 4) emotion-related words used in a different context (e.g. one student stated in their final diary entry that they thought the use of synchronous and asynchronous communication methods should be "stressed" further to students in future collaborative activities).

### **5.1.2 Findings**

In total, 218 emotion-related words were counted in the 80 online diary entries. From these, 80 words (36.7%) described positive emotions and 138 (63.3%) described negative emotions. A total of 17 positive emotions were identified. From these (frequencies provided in brackets), *happiness* (17), *relief* (12) and *confidence* (10) were the most frequently recorded over the four diary entries. A total of 29 negative emotions were identified. From these, *anxiety* (21), *frustration* (18), and *worry* (18) were the most frequently recorded over the four diary entries.

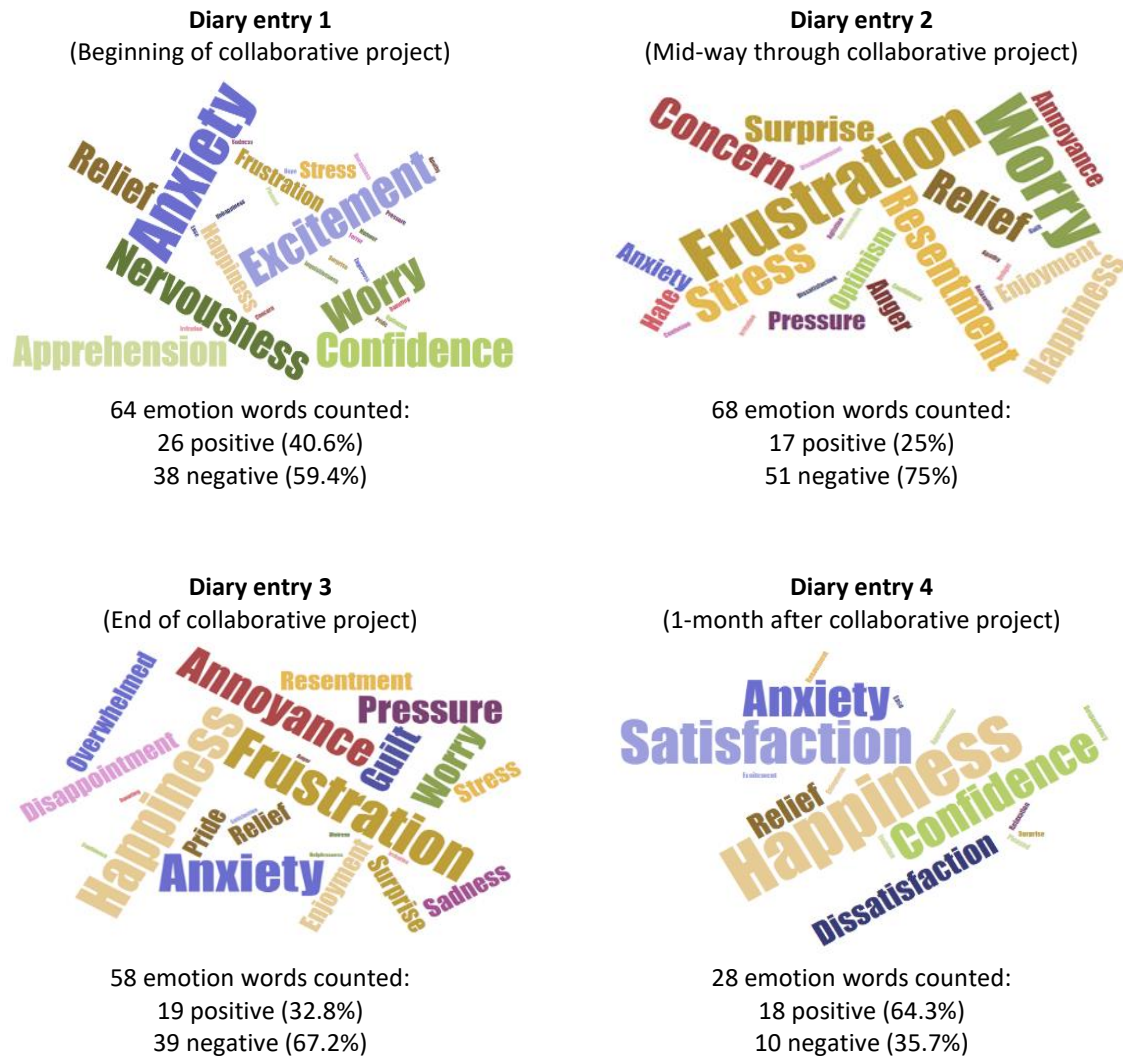


Figure 2: Word clouds of emotion-related words expressed by participants in each of the four diary entries.

Word clouds were created for the frequency of reported emotions in each diary entry (see Figure 2). In diary entries 1, 2 and 3, there was a higher frequency of negative emotions counted than positive emotions. In diary entry 4, there was a higher frequency of positive emotions than negative emotions. There was also a much lower number of emotions overall in this final diary entry. The most frequently counted positive emotions in each diary entry were (frequencies provided in brackets): *excitement* (6) in diary entry 1; *relief* (4) in diary entry 2; and *happiness* (6) in diary entries 3 and 4. The most frequently coded negative emotions in each diary entry were: *anxiety* (11) in diary entry 1; *frustration* and *worry* (both 10) in diary entry 2; *frustration* (6) in diary entry 3; and *anxiety* (3) in diary entry 4.

## 5.2 Case study: creating and sharing images in a digital photography module

### 5.2.1 Context and methods

The second case study is a short non-accredited module: TG089 'Digital photography: creating and sharing better images'. This is a 10-week module that is run twice a year. As part of their study, students are strongly encouraged to become part of an online community of learners. Whilst students do not produce a 'group product' as in TM255, they are encouraged to upload their own photos on a

weekly basis and share them in OpenStudio, a photo-sharing environment (Lotz, Jones, & Holden, 2019). Students develop their visual and technical skills through their activity in OpenStudio, where they are expected to give and receive comments on each other's photos. They are assigned to groups of around 20 but can also view photos from the whole cohort (200-400 students). Students also participate in very active discussion forums which are open to the whole cohort. At the end of the module students each submit 10 photos for assessment.

This case study uses secondary data that comprises postings gathered from the module's online forums and qualitative responses collected from students via an end-of-module survey (which is carried out as a matter of course on all UK OU modules). Both these data sets are much broader than that gathered in the first case study, which was specifically exploring emotional aspects, as the TG089 data sets explore all aspects of students' experiences on the module. However, an initial review of the forum postings and end-of-module survey comments identified that emotion words were being used by students to describe their experiences, and this inspired a further investigation of the data within the context of this research.

Ethical approval for using the data was gained from The OU's Human Research Ethics Committee (HREC/3372) and all data was anonymised so that the identity of individuals could not be compromised. The TG089 cohorts have an even gender balance, ranging from 49-52% female. Students are often older than typical OU UK students: 60% are aged 50 or older.

The end-of-module survey comprises both Likert-type scale questions and also spaces for open comments to questions that enable students to write more detail about their experiences on the module. Questions included for example "What aspects of teaching materials, learning activities or assessment did you find particularly helpful to your learning". Open comment responses to all questions were gathered from four different presentations of the module over 2018 and 2019. The survey response rates ranged between 28-36%, and the surveys produced just over 1500 separate comments, ranging in length from a single word to several paragraphs.

This data was collected 1-4 weeks after the end of the module – however this was before students received their final grades so is equivalent to somewhere between diary entries 3 and 4 in the first case study.

Comments from the end of module survey were analysed using a similar word count analysis as described earlier (Leech & Onwuegbuzie, 2008). The process started with reading and re-reading the qualitative data to become familiar with the content, then the emotion words that had been identified in the first case study were searched for and counted. Again, only the emotions experienced by participants were included. Following this initial search, a final detailed read through was used to identify any new emotion words.

The set of emotion words that emerged from analysis of the survey was also used to analyse forum postings. Text was extracted from the 1846 posts (150,000 words) made in one presentation of the course. These were split into four periods: *Before* (the two weeks before the start date), *Early* (weeks 1 to 5 of the course), *Late* (week 6 to assessment deadline), and *After* (from assessment deadline to results). Software was used to count the emotion words; since posts were not closely read, these counts can only be indicative of the emotions expressed by students. Some words are commonly used to express politeness rather than emotion and therefore the following terms were excluded from

analysis: *please, thank, hope, love, like, sorry, happy* and *connect*. It was also not possible to be certain if students were discussing current or past emotions, or their own or others' emotions.

## 5.2.2 Findings

### 5.2.2.1 Survey

In total, 353 emotion-related words were counted in the end-of-module survey open comments. From these, 162 (45.9%) described positive emotions and 191 (54.1%) described negative emotions (see Figure 3). For positive emotions, a total of 21 emotions were identified. From these (frequencies provided in brackets), *enjoyment* (54), *inspired or stimulated* (19), *gratitude* (13) and *challenged* (13) were the most frequently recorded. For negative emotions, a total of 38 emotions were identified. From these, *disappointment* (36), *confusion* (21), *struggle* (15) and *not confident* (12) were the most frequently recorded.

The final read through to identify new emotion words was fruitful, as 35 additional words (positive and negative) were identified. For example, new positive emotion words included: *inspired or stimulated, encouraged, motivated* and *challenged*. New negative emotion words included: *daunted, struggle, uncomfortable* and *intimidated*.

There were also words identified in the first case study that were noticeably absent from this data. For example: *pride, relief* and *satisfaction* (positive); and *anger* and *fear* (negative). *Frustration*, one of the highest occurring emotions in the previous case study was also quite prevalent here, with 10 mentions. However, *anxiety* or *worry* was not mentioned as much, with only 4 comments relating to these combined. The word cloud below shows the results from all four surveys.

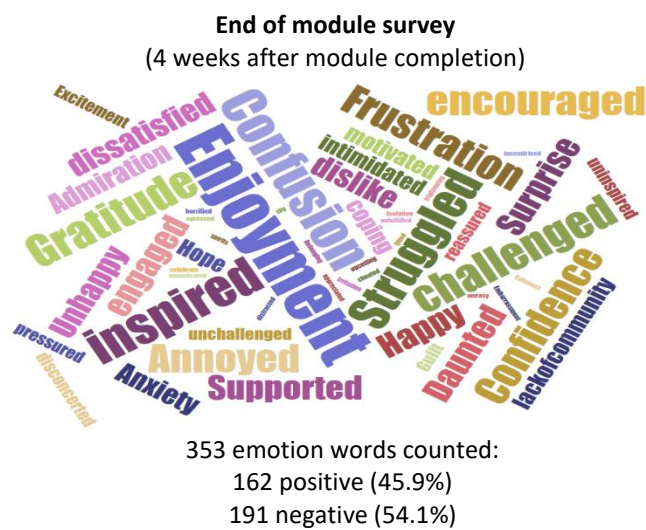


Figure 3. Word cloud of emotion-related words expressed by students over four end of module surveys.

### 5.2.2.2 Forums

An initial 2361 emotion-related words were counted in the forum postings, but some which were frequently used in other senses (such as *please* and *sorry*) were excluded from further analysis. Of the remaining 1025, 696 (68%) described positive emotions and 329 (32%) described negative emotions. A total of 27 positive emotions were recorded, of which the most common were *enjoyment* (175), *interest* (165), *appreciated* (56), *supported* (49), and *encouraged* (30). A total of 26 negative emotions were recorded, of which the most common were *overwhelmed* (41), *anxiety* (40), *difficulty* (38), *confusion* (29) and *unhappiness* (25). Positive emotion terms were more prevalent than in the end-of-



module survey for the same module, and considerably more so than in the TM255 diaries. Nevertheless, students express a range of positive and negative emotions.

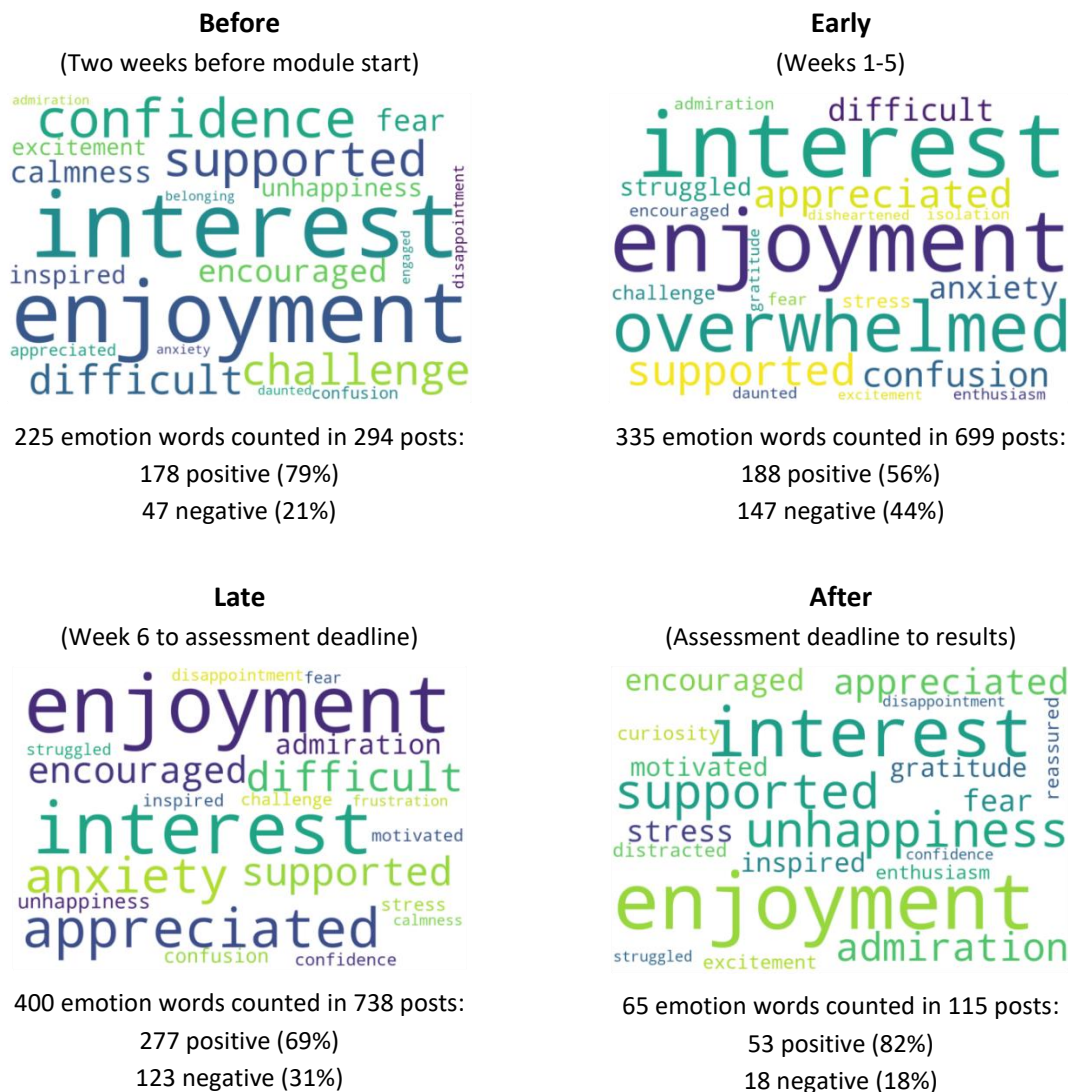


Figure 4. Word clouds of emotion expressed in forum posts in each phase of the course.

Looking at emotions over different periods of the module (see Figure 4), there is clear evidence of shifts of emotion. The majority of emotions are positive (79%) when the forums open and before the module gets underway, become less so during the module (56% in the early phase), and return to very positive emotions (82%) after the module ends.

The count of positive emotions as the forums open and the module gets underway should perhaps be higher still, since an emotion not picked out by the analysis used here is the sense of eager anticipation shown in the forums at this time. This is because anticipation is often expressed as phrases such as *looking forward* which are missed because we search only for single words, or using words such as *hope* which are excluded because they are too often used in other senses.

"I'm really looking forward to chatting with you all and the challenges that this course will bring. I think it's going to be tough squeezing it in with my job and other interests but definitely will be rewarding."

During the main weeks of the photography course, students are busy sharing and commenting on each other's images in OpenStudio. The emotions expressed in these weeks become more negative. A cluster of negative terms – *anxiety*, *difficulty*, *struggle*, and *stress* – make an appearance. Students may say they are overwhelmed by the volume of images to look at, and sometimes daunted by the skill of others.

"I generally felt quite overwhelmed by the pressure to comment on so many images."

"I've been impressed by the standard of work folks have been submitting. Feeling a tad daunted but keen to learn and enthusiastic."

Lacking confidence in their own ability, they may feel unable to comment on the work of others.

"It can be quite intimidating posting photos alongside other students who seem to have a far more advanced skill set, knowledge and who comment on my photos with things I don't understand. On the flipside, I also don't feel confident enough to critique their images due to my inferior knowledge."

However, *enjoyment* remains a common emotion throughout the module:

"I'm really enjoying looking at all your images on Open Studio. I'm finding that I'm learning a lot from this, I just wish I had more hours in the day!"

The final forum postings on TG089 often include an acknowledgement of the support received from module staff and fellow students. This includes emotional support as well as academic support; some students clearly feel able to express their emotions and often receive very supportive replies from their peers.

"many thanks to you all for your assistance, support and comments over the 13 weeks of the course. It has been a great experience and I will miss the 'community' and opportunity to get constant feed-back"

## 6. Discussion

This paper has explored students' emotions when undertaking online collaborative learning activities in modules at the UK OU. Both case studies illustrate that such activities can be highly emotional, with learners reporting a wide range of positive and negative emotions. Findings from the two case studies revealed differences in the overall emotional journeys of students.

In the first case study, TM255 students were found to describe a much higher percentage of negative emotions compared to positive emotions during the collaborative project. This was the case for three out of the four online diary entries; with only the final entry (one month after the collaborative project) having a greater percentage of positive emotions described (see Figure 2). Similar to the findings of Hilliard et al (2019) and Webster (2019), anxiety was the most reported emotion at the beginning of the collaborative activity. Other more frequently described emotions included *worry*, *nervousness* and the positive feeling of *excitement*. These future-oriented, or anticipatory, emotions make sense at this stage due to the uncertainty and unknown nature of the collaborative activity. As the activity progressed, students' emotions changed. During the mid and end stages of the project, the negative

emotion of *frustration* started to become more apparent. This is an emotion that has been found to be common when undertaking online collaborative learning activities (Capdeferro & Romero, 2012) and the change of feelings of *anxiety* to feelings of *frustration* have been reported previously (Hilliard et al., 2019). During the later stage of the project, feelings of *happiness* were also commonly found. Another shift in feelings was observed after the project had been completed, with more positive emotions (such as *happiness* and *satisfaction*) being described. Again, such retrospective emotions would make sense at this stage, as students could reflect on what they had accomplished during the activity. Interestingly, *anxiety* was also still reported in this diary entry. This was, however, predominantly reported by a few students who had not received their final grade for the activity; therefore their feelings of anxiety related to the grade they might receive for the project.

In contrast to the students of TM255, students in TG089 expressed positive emotions to a much greater extent whilst undertaking the social photo-sharing activity in the module (as demonstrated by survey and forum findings). In each of the phases of the activity, a greater percentage of positive emotions than negative emotions was expressed (see Figure 4). Before the activity began, feelings of *interest* and *enjoyment* were frequently mentioned by students. Experiencing more positive feelings before commencing online collaboration was reported by Hilliard et al (2019); however, many of the specific positive emotions reported in that study are different to those expressed by TG089 students. During the main weeks of the TG089 course, the emotions of *interest* and *enjoyment* were both still prevalent. There was, however, an increased expression of negative emotions, such as being *overwhelmed*, and experiences of *anxiety*. As with TM255, after the completion of the TG089 module, increased expressions of positive feelings were found.

The results of these two case studies demonstrate the differing emotions that can be experienced when undertaking online social and collaborative learning. One of the main factors that could help explain the contrasting emotional experiences of students in the two modules is the differing nature of the tasks that were being undertaken. The collaborative group project in TM255 involved creating an assessed shared piece of work (a website) which directly impacted each student's overall mark for the assignment. Furthermore, the group interaction between TM255 students was marked and contributed to each student's overall grade for the assignment. This is very different to the activity in TG089, where students submitted individual photos for assessment. Student interaction was not mandatory and did not count towards a student's overall grade for the assignment. Therefore, the pressure for TG089 students to interact was much less. Previous research has highlighted that assessment of online collaboration, especially interaction between learners, can increase negative emotions (Donelan & Kear, 2018; Hilliard et al., in press).

It could be thought that the assessed nature of the collaborative group project in TM255 led to perceptions of increased importance and value of activity, as well as a reduced perceived level of controllability of the task (due to others being able to impact students' overall mark in the assignment). According to Pekrun's (2006) control-value theory of emotions, these appraisals (increased value and reduced control) would have led to an increased experience of many negative emotions (such as *anxiety*). Although students in TG089 may have had a similar sense of value and importance for the photo-sharing task in the module, their perceived level of control may have been higher, due to students individually submitting their own work for assessment and not relying on others to produce a shared piece of work. Such appraisals of control and value would have led to



increased positive emotions such as *enjoyment* (Pekrun, 2006). However, as control and value appraisals were not explored explicitly in this study, firm conclusions cannot be drawn on this theory.

Another important finding from this study was that there was a higher percentage of positive emotions described by students in TM255 and TG089 (forum data) after the completion of the collaborative activities. Although moderate to high levels of satisfaction have been reported after undertaking online collaboration (Dewiyanti, Brand-Gruwel, Jochems, & Broers, 2007; Zhu, 2012), very few studies have investigated other emotions experienced after the completion of such activities. In the two case studies reported in this paper, many other positive feelings (such as *happiness*, *enjoyment* and *confidence*) were mentioned by learners. The length of time after the collaboration activity has finished may also be an important consideration when exploring emotional experiences. For instance, in the TM255 case study, the final diary entry was completed a month after the group project had finished. During this time the majority of students received their grade for the assessment, which may have increased the positive feelings experienced by learners. Altogether, this finding highlights the importance of exploring students' feelings of their online collaborative experiences after the activities have been completed. Without this exploration, a full understanding of the emotional experiences of undertaking online social and collaborative activities would not be complete. This finding may have implications for prompting students to reflect on their experiences: this is commonly done at the end of the activity but should perhaps be done at a later point to allow time for feelings to develop.

Several different data sources were used to explore the emotions of learners whilst undertaking online collaborative learning activities reported in this paper. The use of a solicited online diary proved to be an effective research method for gathering data about student emotion during the assessed collaborative project in TM255. Secondary data, in the form of postings on the TG089 module's online forums and qualitative responses collected from an end of module survey, also proved to be a very useful way of exploring student emotion without increasing the work load of learners during their study. In both investigations, word count analysis was undertaken to calculate the frequency of emotion-related words in data sources. This analysis method was able to identify many emotions that were experienced in relation to undertaking the online collaborative activities.

## **7. Conclusion and implications**

This study has made a contribution towards understanding the emotions experienced by students in a distance learning setting, where students interact with other students and contribute to collaborative activities online. Very few studies have explored students' emotions in these settings.

The study explored contrasting activities in two distance learning modules: an IT module where students work together in a small group to produce a website; and another where students on a photography module share and comment online on each other's individual photos. Whilst the first module contributes to part of an undergraduate degree, the second is a non-accredited module; however both are assessed.

Both case studies have shown that taking part in online collaborative learning activities is a highly emotional experience for students, although differences in the emotional journey between students on the two modules were identified. Feelings about the IT module's group project were initially more negative, with *anxiety* being the predominant emotion, in contrast to the photography module where

emotions of *enjoyment* and *interest* were initially expressed. *Anxiety* changed to *frustration* during the group project, and then finally positive emotions of *happiness* and *satisfaction* emerged after it had finished.

Different factors may contribute to the emotions that students experience: for example, the nature of tasks, dependency of grades on other students, and students' perceptions of how much control they have over the situation. To help manage emotions it is important that students are supported at all stages of collaborative learning activities. Some of the practical implications of this work are highlighted below.

- In designing collaborative learning activities, it is important to minimise the frustration students may encounter when relying on other students' contributions, whilst still ensuring tasks are engaging and inspire feelings of enjoyment and satisfaction.
- Prior to starting the activities, it is helpful to prepare students by openly acknowledging the emotional aspects involved and that students may experience a range of positive and negative emotions. It is important to recognise that some of the feelings they may experience cannot be avoided, but they can be managed. One suggestion would be to share feedback from students who have previously undertaken the activities (or even word clouds such as those used in this paper) that describe the emotional journey they experienced.
- During the activity it is important that students feel supported. Negative emotions do not always have a negative effect on participation and performance (Hillard et al., 2019) and can be facilitative. However, it is important to provide support for students if emotions are strong and persistent and are having negative effects on students' well-being or performance.
- Finally, past research has shown that failure to achieve 'closure' after completion of collaborative learning activities leads to extended 'unsettled feelings' (Melrose & Bergeron, 2007). Encouraging students to share with others what they have learned, and providing students with the opportunity to reflect on their experiences, may help bring about closure. This in turn may allow students to express positive emotions associated with closure.

We end this paper by reflecting on the data and methods used in this study, and ideas for future work. The data collected and analysed was from different sources and in different formats, including diary entries, forum data and end-of-module survey results. The same approach to analysing the different types of data was used in each case. This involved identifying emotion-related words and counting their frequency. Similar approaches have been used to explore student emotions in previous literature (Hascher, 2008; Stupnisky, Pekrun, & Lichtenfeld, 2016). There were challenges in applying the same technique to these different forms of data; for example, some were more descriptive, or voluminous than others. In addition, the diary data was specifically collected to explore emotions, whereas the forum and survey data were broader in their scope of student feedback; this breadth made it more difficult to identify emotion-related words in contexts that were significant. Finally, the work was limited to identifying instances of emotions, not the reasons for them. Whilst we have discussed possible reasons that may influence the occurrence of different emotions, exploring these in more depth is recommended for future work.

## **8. Acknowledgements**

The authors wish to thank our colleague Tony Hirst for help in extracting text from the forums. We also wish to thank the students whose words we have quoted.

## 9. References

- Artino, A. (2012). Emotions in online learning environments: Introduction to the special issue. *The Internet and Higher Education*, 15(3), 137–140.
- Binkley, M., Erstad, O., Herman, J., Raizen, S., & Ripley, M. (2012). Defining 21st century skills. In P. Griffin, B. McGaw, & E. Care (Eds.), *Assessment and teaching of 21st century skills* (pp. 17–66). Heidelberg: Springer.
- Boekaerts, M., & Pekrun, R. (2016). Emotions and emotion regulation in academic settings. In L. Corno & E. M. Anderman (Eds.), *Handbook of educational psychology* (3rd edn, pp. 76–90). Abingdon, Oxon: Routledge.
- Capdeferro, N., & Romero, M. (2012). Are online learners frustrated with collaborative learning experiences? *The International Review of Research in Open and Distributed Learning*, 13(2), 26–44.
- Donelan, H., & Kear, K. (2018). Creating and collaborating: students' and tutors' perceptions of an online group project. *International Review of Research in Open and Distributed Learning*, 19(2), 37–54.
- Harasim, L. (2017). *Learning and theory and online technologies* (2nd edn). Abingdon, Oxon: Routledge.
- Hascher, T. (2008). Quantitative and qualitative research approaches to assess student well-being. *International Journal of Educational Research*, 47(2), 84–96.
- Hilliard, J., Kear, K., Donelan, H., & Heaney, C. (in press) Students' experiences of anxiety in an assessed, online, collaborative project. *Computers & Education*.
- Hilliard, J., Kear, K., Donelan, H., & Heaney, C. (2019). Exploring the emotions of distance learning students in an assessed, online, collaborative project. *Connecting through Educational Technology - Proceedings of the European Distance and E-Learning Network 2019 Annual Conference*, 251–259. Bruges, Belgium.
- Järvelä, S., Kirschner, P. A., Panadero, E., Malmberg, J., Phielix, C., Jaspers, J., ... Järvenoja, H. (2015). Enhancing socially shared regulation in collaborative learning groups: Designing for CSCL regulation tools. *Educational Technology Research and Development*, 63(1), 125–142.
- Leech, N. L., & Onwuegbuzie, A. J. (2008). Qualitative data analysis: A compendium of techniques and a framework for selection for school psychology research and beyond. *Psychological Association*, 23(4), 587–604.
- Linnenbrink, E. A. (2006). Emotion research in education: Theoretical and methodological perspectives on the integration of affect, motivation, and cognition. *Educational Psychology Review*, 18(4), 307–314.
- Lotz, N., Jones, D., & Holden, G. (2019). OpenDesignStudio: virtual studio development over a decade. *Proceedings of the DRS LearnXdesign Conference 2019*. Ankara, Turkey.
- Mayer, R. E. (in press). Searching for the role of emotions in e-learning. *Learning and Instruction*.
- Melrose, S., & Bergeron, K. (2007). Instructor immediacy strategies to facilitate group work in online graduate study. *Australasian Journal of Educational Technology*, 23(1), 132–148.
- Menard, S. (2008). *Handbook of longitudinal research: Design, measurement, and analysis*.

Burlington, MA: Academic Press.

Pekrun, R., Muis, K. ., Frenzel, A. ., & Goetz, T. (2018). *Emotions at school*. Abingdon, Oxon: Routledge.

Reis, R. C. D., Isotani, S., Rodriguez, C. L., Lyra, K. T., Jaques, P. A., & Bittencourt, I. I. (2018). Affective states in computer-supported collaborative learning: Studying the past to drive the future. *Computers & Education, 120*, 29–50.

Scherer, K. R. (2005). What are emotions? And how can they be measured? *Social Science Information, 44*(4), 695–729.

Stupnisky, R. H., Pekrun, R., & Lichtenfeld, S. (2016). New faculty members' emotions: a mixed-method study. *Studies in Higher Education, 41*(7), 1167–1188.

Tyng, C. M., Amin, H. U., Saad, M. N. M., & Malik, A. S. (2017). The influences of emotion on learning and memory. *Frontiers in Psychology, 8*(1454).

Webster, E. A. (2019). *Regulating Emotions in Computer-Supported Collaborative Problem-Solving Tasks*. University of Victoria.

## Teaching English Pronunciation in a MOOC: a complement to official regulated subjects

**Eva Estebas-Vilaplana**

Universidad Nacional de Educación a Distancia (UNED)  
eestebas@flog.uned.es

**Mariángel Soláns**

Universidad Nacional de Educación a Distancia (UNED)  
masolans@flog.uned.es

### Abstract

Over the last few years, Massive Open Online Courses (MOOCs) have emerged as a new model of online teaching which coexists with other forms of distance learning (Baker, 2012; Castrillo, 2014). This paper examines how MOOCs can offer alternative ways of instruction that can complement the curricula of official regulated subjects in higher education. In particular, we analyse the effects of the MOOC "The Acquisition of English Pronunciation through Songs and Literary Texts" on the proficiency rates of English pronunciation performed by a group of Spanish speakers. The MOOC, designed by a team of teachers from the Distance Learning University in Spain (UNED), was offered as additional voluntary work for four weeks to the 640 students registered in the subject *English Pronunciation*, a compulsory course in the second year of the *Degree in English Studies* (UNED). The MOOC followed a new approach to phonetics teaching based on the stress and rhythmic patterns of literary and music forms, which differs from the traditional models of English phonetics tuition mainly based on vowel and consonant contrasts. The pronunciation competences of the students were measured as part of a final oral exam which assesses a variety of pronunciation phenomena, including both segmental and prosodic features. The students that followed the MOOC showed better results in English pronunciation than those that only worked with the materials and the methodology offered in the course. These results enhance the benefits of using MOOCs as extracurricular input to official regulated higher education programs.

**Keywords:** MOOC, English pronunciation, distance learning, stress, rhythm.

### 1. Introduction

#### 1.1 Massive Online Courses

The huge potential of the Internet together with the growth of different technological devices as a learning tool, are transforming the field of formal and non-formal education. These changes in educational technology are also supporting the higher education landscape. Many universities are adapting to this trend and are implementing innovative e-learning methodologies to complement and enhance their curricula. This is the case of the OpenCourseWare (OCW) sites, which provide open access to educational materials delivered by universities and educational institutions, and subsequently the Massive Open Online Courses (MOOCs, a term coined in 2008), that over the last years have emerged as a new model of online teaching which coexists with other forms of distance learning (Baker, 2012; Castrillo, 2014). These online courses promote no-cost access to a large number of participants of any age and geographic location who can enrol and achieve their learning goals at their own pace with the only requirement of having access to a computer or a mobile device with an internet connection.

This innovative tool within the related fields of formal education, lifelong learning and non-formal training (Bárcena & Martín-Monje, 2014) is being provided by some of the world's leading universities, such as Stanford, Harvard or MIT. The courses they offer cover a wide range of academic disciplines and are freely available through platforms such as edX, Coursera, Udacity, Khan Academy or FutureLearn.

In Spain, the landscape of MOOCs has been increasing since 2012 being the National Distance Education University (UNED), the first institution offering these courses (Gil-Jaurena, 2015, p. 195). From its foundation in 1972, the UNED, the university with the largest student population in Spain and one of the largest universities in Europe, is always implementing new models of Information and Communication Technologies (ICT) to enrich its distance educational methodology (Domínguez & Álvarez, 2019). Through UNED Abierta, the UNED is contributing to the open education with a great offer of courses, including MOOCs. Some of these MOOCs are being designed and implemented by university teachers to be integrated as an extension and complement of some official regulated subjects in higher education with the aim of helping lower-level students to reach the introductory level of certain subjects. This pioneering training initiative showed favourable results in undergraduate courses such as *Professional English* of the *Degree in English Studies* (Castrillo & Martín-Monje 2018). In this paper, the impact of an LMOOC on English phonetics on the pronunciation competences of the students of the undergraduate course *English Pronunciation* will be examined.

Our MOOC "The Acquisition of English Pronunciation through Songs and Literary Texts" is classified under the taxonomy of language MOOCs or LMOOCs (a term coined by Bárcena & Martín-Monje in 2014), as they are related to teaching and learning a second language, or to a specific area of the language, as pronunciation. In fact, one of the most prolific countries in the world for LMOOCs along with the United States is Spain and accordingly, the most popular languages offered are English and Spanish (Martín-Monje & Bárcena, 2014, p. 5).

The main aim of this paper is two-fold: 1) to analyse how an LMOOC on English pronunciation can be incorporated in the curricula of an official regulated subject, namely, the undergraduate course *English Pronunciation* offered at the National Distance Education University in Spain (UNED), as part of the *Degree in English Studies*, and 2) to examine the effects of the LMOOC on the proficiency rates of English pronunciation performed by the students of this course.

## 1.2 Teaching English Pronunciation in a distance learning environment

Over the last fifty years, the subject *English Pronunciation* or *English Phonetics* has been part of most degrees in English Philology or English Studies at Spanish universities. The first syllabuses on English pronunciation mainly focused on articulatory phonetics and covered the production and description of segmental features, that is, vowels and consonants. More recently, the syllabuses have incorporated suprasegmental and prosodic features, such as stress rhythm, and intonation, which have proved to be crucial for a good command of English pronunciation (Jenkins, 2000; Walker, 2011).

Teaching English pronunciation to Spanish speakers, however, is not an easy task due to the outstanding differences between the two phonetic systems (Estebas-Vilaplana, 2009). For example, whereas the vocalic system of standard Spanish consists of five vowels, the English one (as in Southern British English) contains *twelve* vowels and, not only that, none of the English vowels coincides in quality with any of the Spanish ones. Similarly, Spanish has 19 consonants as opposed to 24 English consonants. With respect to prosodic features English and Spanish also differ in many areas, such as in the levels of stress, the rhythmic patterns, the focalization strategies and the intonation patterns.

If teaching English pronunciation has always been an arduous task, it becomes even harder in a distance learning environment where there is no face-to-face tuition and there is no possibility of giving immediate feedback to the students. In 2009, a new *Degree in English Studies* started at the UNED (National Distance Education University in Spain) which included the subject *English Pronunciation*. This course involves 150 hours of distance learning tuition with access to the virtual course on the UNED learning platforms. It is distributed in four months during the second-term. The aim of the course is to give students guidelines, tools and methodological resources for the autonomous learning of English pronunciation. Over the past five years, an average of 800 students per year has registered for the course. The syllabus includes: 1) English Vowels, 2) English Consonants, 3) Combination of Sounds and Connected Speech Processes, 4) Stress and Rhythm, and 5) Focus and Intonation. This syllabus covers the typical contents of an English pronunciation subject offered in higher education courses. The topics are also presented in the canonical order, that is, the course starts with vowels and consonants and it finishes with prosodic features (stress, rhythm and intonation).

At the end of the year, the pronunciation competences of the students are measured by means of two tests: 1) a written exam which covers some theoretical issues and a phonetic transcription, and 2) an oral exam which assesses a variety of pronunciation phenomena, including both segmental and prosodic features, as well as the reading of a paragraph in phonetic transcription. Since the first time this course was offered in 2009, one of the main concerns of the students has been how to approach the oral part and succeed in the oral exam. Despite the great number of helping materials provided in the course to do the oral test, such as video-classes, a mock exam and well-defined assessment criteria, including evaluation rubrics, the vast majority of students feel worried about this test and how to overcome it.

## **2. LMOOC on English pronunciation**

### **2.1 A new approach to phonetics teaching and learning**

In the year 2018-2019, a team of teachers from the *Departamento de Filologías Extranjeras y sus Lingüísticas* at the UNED who are also members of the INME-3L Teaching Innovation Group, decided to implement an LMOOC entitled *Aprendizaje de la pronunciación inglesa a través de canciones y textos literarios* ("The Acquisition of English Pronunciation through Songs Literary Texts") with two main purposes: 1) to help students of the course *English Pronunciation* to feel more confident about the subject and, in particular, about their productions in the oral exam; and 2) to turn English pronunciation into a more enjoyable and friendly subject which could reach a broader audience including students with little knowledge of linguistic issues. In order to do that, a top-down approach to phonetics teaching was adopted. This involved teaching phonetics from prosody to sounds, that is, from the rhythmic pattern of sentences to specific vowel and consonant contrasts. This is the opposite approach to most higher education courses on English phonetics which start with the description of the vocalic and consonantal systems to finally present prosodic features. This new methodology to phonetics teaching was possible due to the flexibility both in terms of contents and syllabus design that a MOOC can offer.

This new approach to phonetics teaching was based on the results of several studies on how prosodic features influence the English pronunciation of non-native speakers. The works of Barreiro, et al. (2005 a/b), Estebas-Vilaplana, et al. (2006), Arines (2008), and Estebas-Vilaplana (2009, 2019) showed that Spanish students of English improve their English pronunciation when they recite a poem or sing a song in English, since the rhythmic and the stress patterns of the verse have a positive effect on the pronunciation of the overall text. Otherwise, their pronunciation worsens when they pronounce English spontaneously, that is,



without taking into consideration the rhythm of the sentence. For the first time, the teaching of phonetics from prosody to sounds has been incorporated in a language MOOC.

The main reason why Spanish students improve their English pronunciation when they sing or recite is closely related to the differences in the rhythmic patterns of the two languages. While Spanish is a syllable-timed language, that is, is a language in which syllables (no matter whether they are stressed or unstressed) tend to be produced at equal time intervals, English is a stress-timed language, which involves a similar amount of time from one stressed syllable to the next (see Cruttenden, 2008, and Roach 2009, among others). Thus, the higher the number of unstressed syllables between stresses in English the quicker they will have to be uttered so as to maintain a similar amount of time between stressed syllables. This has an effect on the production of vowels. In order to be able to compress the duration of syllables between stresses and keep a stress-timed rhythmic pattern in English, most unstressed syllables tend to be produced with a weak vowel (see Estebas-Vilaplana, 2009, 2019). Thus, the pronunciation of vocalic sounds in English highly depends on the stress condition of the syllable. In rare occasions is this idea presented in a class of English as a second language. Thus, most Spanish speakers pronounce English based on the syllable-timed rhythm typical of Spanish. The immediate consequence of this practice is that Spanish speakers produce all English syllables with an equal length, with a full vowel quality and without any vowel weakening, as in Spanish.

Based on this evidence, the LMOOC designed and taught by the INME-3L team of teachers included songs and literary texts (both poems and prose) as the starting point to teach English pronunciation. Songs and literary texts, especially those written in verse, create certain restrictions on the production of sentences which have to accommodate to the rhythmic structure. Thus, the LMOOC was designed with the idea that the rhythmic patterns of the songs and poems would help students to focus on the production of the vowels in the stressed syllables and subsequently weaken the production of the vowels in the unstressed syllables. Once the students have learned this process, they could apply it to prose and finally to spontaneous speech.

The purpose of this LMOOC was also to examine the effects of *implicit learning* on the acquisition of English pronunciation by non-native speakers. Over the last few decades, an issue of debate in the field of second language (L2) learning has been the advantages and disadvantages of implicit learning as opposed to those of *explicit learning*. Whereas explicit learning involves the conscious acquisition of knowledge through formal instruction, implicit learning consists of acquiring knowledge non-intentionally, that is, the learner is not conscious of what he or she is learning (Frensch, 1998; Hayes and Broadbent, 1988; Reber, 1967). Even though for a long time both approaches were presented as categorically different, more recent research has proved that the two processes can co-exist and work simultaneously (Rossetti & Revonsuo, 2000; Sun, Slusarz & Terry, 2005; and Dörnyei, 2006) and that the combination of both methodologies proves to have positive effects on the learning/acquisition process (Latinjak, 2014).

## 2.2 Impact of the LMOOC

The LMOOC *Aprendizaje de la pronunciación inglesa a través de canciones y textos literarios* ran for four weeks, from March 11 to April 7, 2019. The course was divided into four modules with the following contents: 1) Module 1 (English Rhythm); 2) Module 2 (English vowels); Module 3 (English consonants), and Module 4 (Final conclusions). Modules 1 to 3 were further subdivided into five sections, each of them corresponding to a video-class. Each video recording lasted an average of 15 minutes. Overall, the course consisted of 16 video-classes. The "massive" nature of the LMOOCs makes it impossible for the teaching team to assess individually the progress of the participants. Therefore, the course included a battery of 20 multiple-choice perception exercises at the end of each module with immediate feedback for self-

assessment as well as discussion forums where participants can pose their questions. The course also included an initial and a final questionnaire to gather some information about the participants and know whether the course contents had met their expectations. From the data we obtained, 1709 students registered for the course being the median learner age 43. More than a half of the participants were aged more than 41 years.

7.6% Learners 25 and Under

33.9% Learners 26 to 40

58.5% Learners 41 and Over

As far as the level of education of the participants is concerned, more than a half held a university degree and almost a quarter of them were postgraduate students.

6.2% Primary or Secondary education

62.2% University degree

28.2% Postgraduate studies

With respect to gender, 70,8% of the participants were female and 28,1% male. Finally, people from 14 countries registered for the course. Most of the MOOC participants were from Spain but there were also a few from other countries, such as Latin America (Colombia, Costa Rica, Mexico, Bolivia, Ecuador, Guatemala, and Venezuela) and also Bulgaria, Germany, UK, Italy, Luxemburg, and Portugal.

The LMOOC received very good reviews from the participants. According to the students that answered the final questionnaire (459), 91% indicated that the course had accomplished their expectations in terms of English pronunciation learning (see Figure 1).

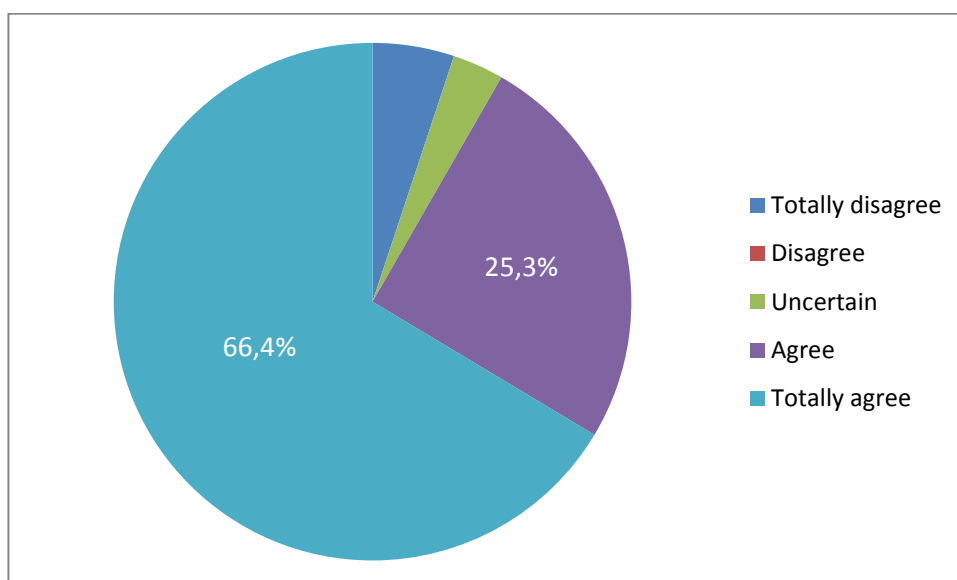


Figure 1: Percentage of responses to the question: Has the LMOOC accomplished your expectations in terms of English pronunciation learning?

Furthermore, 97,4% of the participants that answered the questionnaire alleged that the LMOOC had helped them to improve their English pronunciation (See Figure 2).

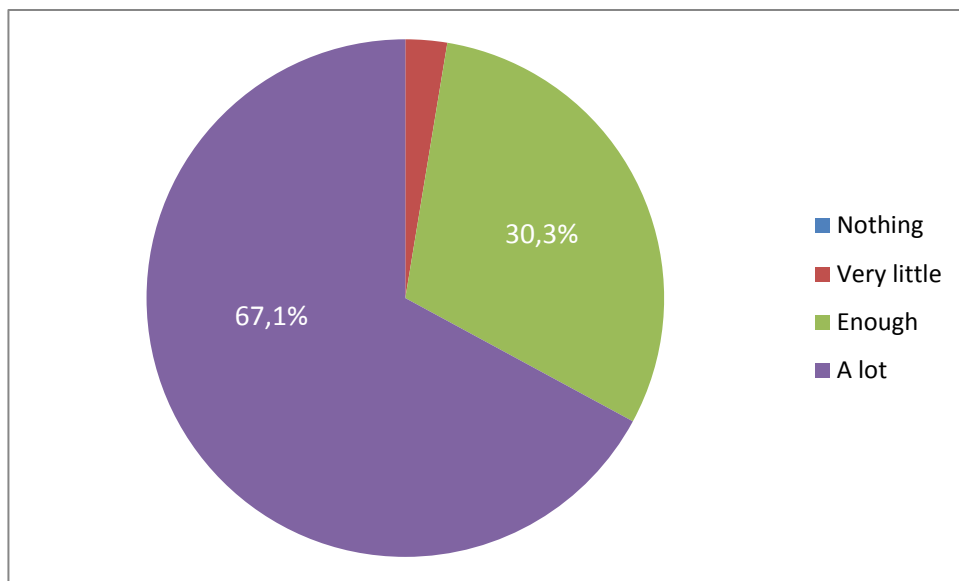


Figure 2: Percentage of responses to the question: How has the LMOOC helped to improve your English pronunciation?

Finally, as presented in Figure 3, the participants believed that the most useful topic presented in the course has been the module on rhythm (63,4%) while 26% of the participants answered that all topics were useful.

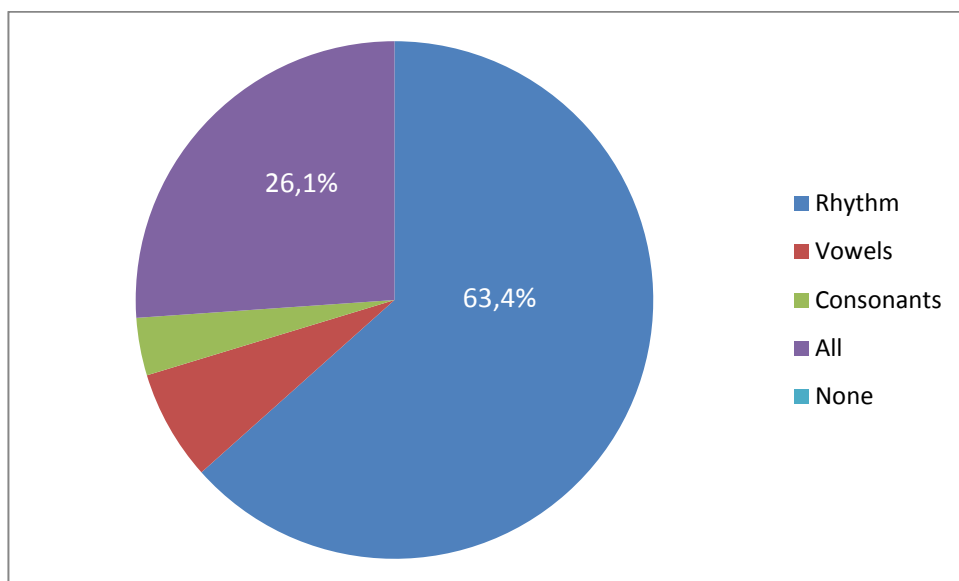


Figure 3: Percentage of responses to the question: Which of the following topics have been more useful to improve your English pronunciation?

These results revealed that the new approach to English phonetics teaching had a positive effect on the students who found it useful to improve their pronunciation skills. A crucial observation is the idea that most of the students found rhythm as the most useful topic. This is closely related to the fact that suprasegmental features are hardly ever covered in an English class and hence the students appreciated tackling English pronunciation at the sentence level with the implicit help of music and literary forms.

### 3. Experimental design

This section analyses the effects of the LMOOC on the pronunciation skills of those students registered in the undergraduate course *Pronunciación de la Lengua Inglesa (English Pronunciation)* so as to examine the advantages and disadvantages of including a MOOC as extracurricular input to official regulated higher education programs. Overall, 142 students (out of 640) from this undergraduate course completed the LMOOC that was offered to them as a voluntary activity. The effects of the LMOOC on the pronunciation skills of these students were assessed by means of an oral exam at the end of the course. It was expected to find relevant differences in the pronunciation of the students that followed the LMOOC as opposed to those that did not. The two working hypotheses are as follows:

1. The students that complete the LMOOC will show better proficiency rates in English pronunciation in the oral test than those that do not complete it.
2. The students that complete the LMOOC will do particularly better in the production of a long paragraph (in phonetic transcription) since it focusses on the pronunciation of sentences rather than specific sounds.

Thus, this study compares the proficiency rates in English pronunciation of two groups of students registered in the course *English Pronunciation* as part of the *Degree in English Studies* at the UNED. Both groups of students followed the same tuition guidelines and worked with the same types of teaching tools, namely, video-classes, a textbook and a software package with ear-training materials and exercises. The syllabus presented in the course followed the typical bottom-up approach used in all higher-education courses on English phonetics which goes from segments to prosodic features, that is, vowels, consonants, combinations of sounds, connected speech processes, stress, rhythm, focus and intonation. The type of tuition offered in the course was mainly explicit, with formal instruction on each topic.

Additionally, the students were offered to voluntarily join the LMOOC which was open for four weeks during the four-month duration of the course. The contents of the LMOOC were similar to those of the regulated course but were presented in the reverse order, that is, from the rhythmic patterns of the music and literary forms to sounds. The students that joined the LMOOC could also benefit from an implicit learning methodology since they could approach English pronunciation through songs and literary texts, without explicit attention to phonetic issues.

#### 3.1 Informants

The students that took part in this study were those who sat for the oral exam of the subject *English Pronunciation* in the academic year 2018-2019. Table 1 presents the number of students registered in the course as well as those who did the oral test, having or not completed the LMOOC.

Table 1: Number of students that completed the LMOOC and did the oral exam.

Number of students in the course <i>English Pronunciation</i> in 2018-2019	
Overall number of students in the course <i>English Pronunciation</i>	640
Number of students that did the oral test	334
Number of students that completed the LMOOC	142
Number of students that completed the LMOOC and did the oral test	142
Number of students that did not complete the LMOOC but did the oral test	192

As exhibited in Table 1, 334 students out of 640 did the oral test, being the number of students that completed the LMOOC 142. All the students that did the LMOOC sat for the oral test. Finally, 192 students

did the oral test but not the LMOOC. Thus, group A (students with LMOOC) is made up of 142 informants and group B (students without LMOOC) includes 192 informants.

### 3.2 Data gathering

The data to assess whether the students that have completed the LMOOC showed better proficiency rates in English pronunciation, was gathered as part of the oral exam of the subject *English Pronunciation* in the academic year 2018-2019. The oral test is recorded by means of the *e-oral* application, which is a software designed at the UNED to do oral exams on-line (López et al. 2006; Alba Juez et al. 2006). The oral test is divided into three parts: 1) the production of English vowels, consonants and consonant clusters, 2) the production of English stress, rhythm, focus and intonation patterns, and 3) the reading of a phonetic transcription which assesses the pronunciation competences at the discourse level and it covers fluency, intelligibility, weak forms and connected speech processes.

## 4. Results

The results of the oral test showed that those students that had completed the LMOOC obtained better proficiency rates than those that had not done it. Figure 4 shows the percentage of students that passed the oral test with and without completing the LMOOC. As exhibited in Figure 4, 100% of the students that completed the LMOOC succeeded in the oral exam. The percentage of students that passed the oral exam without LMOOC is 67%. A t-test comparing the results of the two groups highlighted significant differences at  $p < 0.05$ . These results confirm that the LMOOC has had a positive effect on the success of the oral test.

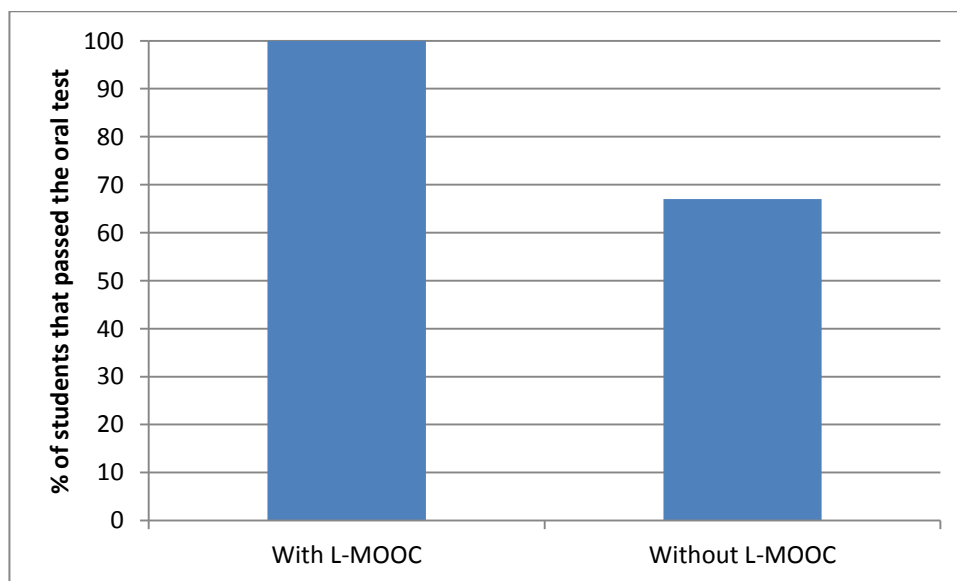


Figure 4: Percentage of students that passed the oral-test with and without LMOOC.

These findings are corroborated by the final mark mean values obtained by the two groups of students. As exhibited in Figure 5, the final mark mean value for those students that completed the LMOOC is 8.1 (out of 10), as opposed to 6,6 (out of 10) for those students that did not conducted the LMOOC. These mean values correspond to pass marks, that is, failed exams are not included in this calculation. The results of a t-test showed that the differences in the oral exam grades for the two groups are significant at  $p < 0.05$ .

Thus, both the results related to the pass percentage and the pass mean values show that the students who took the LMOOC did much better in the oral exam than those without LMOOC. This corroborates our initial hypothesis since the students that completed the LMOOC had better proficiency rates in English

pronunciation. This further indicates that the incorporation of a MOOC as extracurricular input to undergraduate courses can be highly beneficial for the students.

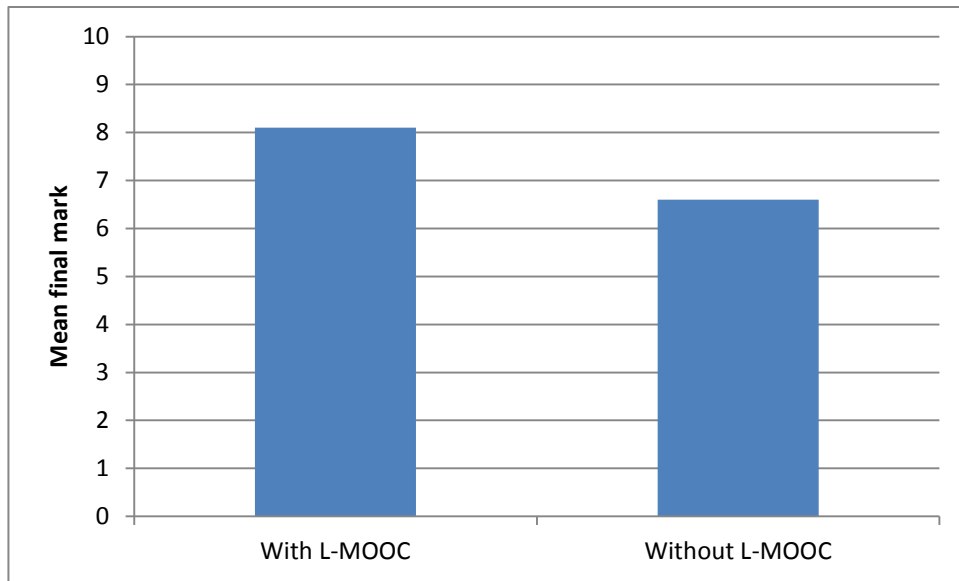


Figure 5: Final mark mean values obtained by the students with and without LMOOC.

Finally, Figure 6 below shows the percentage of correct responses in the three tasks included in the oral exam for the students with LMOOC and those without LMOOC. The first task, related to the production of consonants and vowels, does not show significant differences ( $p > 0.05$ ) in the productions of the two groups (89% of correct responses for the students with LMOOC and 85% for the students without LMOOC). This is a rather expected result since the practice of vowel and consonant contrasts is recurrent in the course materials. With respect to the production of prosodic features, the results show a higher number of correct responses for the students who completed the LMOOC (76%) as opposed to those that did not do it (61% of correct responses). The results of a t-test show that the differences between the two groups are significant ( $p < 0.05$ ). This suggests that students could better grasp the rhythmic and the accentual patterns of English by paying attention to texts with a well-defined rhythmic structure, such as music and literary forms. This also indicates that combining explicit and implicit learning can be beneficial for the acquisition of English pronunciation.

The final task of the oral exam consisted of reading a passage in phonetic transcription. This is the task that tends to be more difficult for the students because it covers the pronunciation of sentences rather than concrete sounds. As presented in Figure 6, the LMOOC had a positive effect on the production of passages in phonetic transcription, since the students who had completed the LMOOC exhibited 24% of better results than those that did not do it (54% vs. 78%). The results of a t-test showed significant differences between the two groups ( $p < 0.05$ ). These results confirm the second hypothesis that the LMOOC is more beneficial for the production of sentences and paragraphs than the actual single sounds. Thus, approaching English pronunciation from the rhythmic pattern of sentences has proved to be a suitable method to help students tackle the production of longer texts.

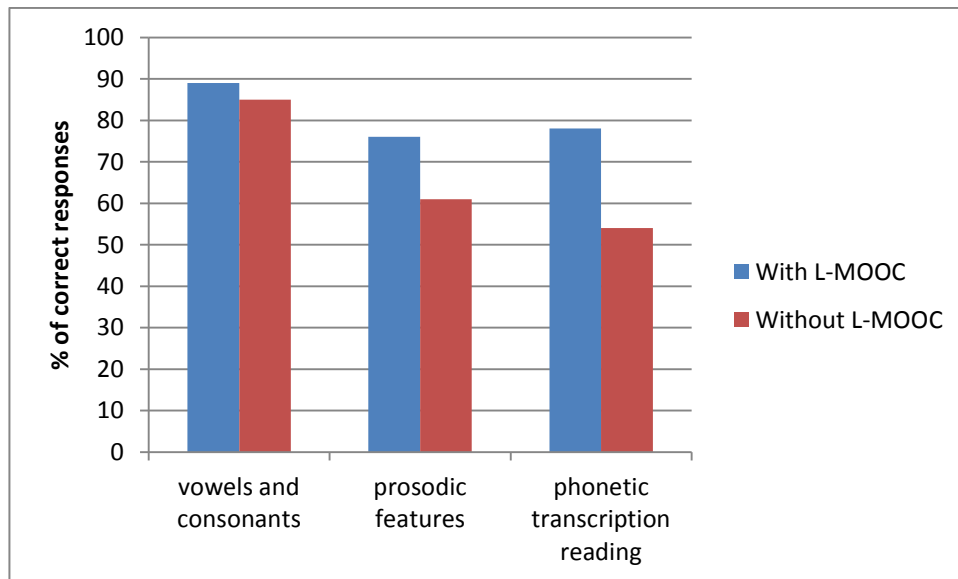


Figure 6: Percentage correct responses in the three tasks of the oral exam for students with and without LMOOC.

## 5. Conclusions

This paper has examined the effects in a university course of the LMOOC "The Acquisition of English Pronunciation through Songs and Literary texts" implemented by a team of teachers from the *Departamento de Filologías Extranjeras y sus Lingüísticas* at the UNED. This LMOOC proposes a new methodology to English phonetics teaching which adopts a top-down approach, from suprasegmental features (rhythm and accent) to sounds (vowels and consonants). This new approach to phonetics teaching and learning has been highly accepted by the students who completed the course successfully.

This 4-week LMOOC was offered as additional voluntary work to the students registered in the undergraduate course *English Pronunciation* from the *Degree in English Studies* (UNED) with the aim of helping them to improve their oral skills and overcome the final oral test. The well-motivated students that took the opportunity to complete the LMOOC showed better results in English pronunciation than those that did not join the course. Thus, these students benefited from two processes of learning, i.e., an explicit methodology found in the course materials and in the textbook and an implicit methodology used in the LMOOC which introduced English pronunciation by means of songs and literary texts. The better results in the oral test of the students that joined the LMOOC enhance the idea that a combination of an implicit and an explicit teaching methodology can have relevant benefits in the students' learning process.

The results of this study have also proved that non-formal LMOOCs hold a huge potential as complements to official regulated courses in higher education and in the case of our course, to improve the oral skills in the target language.



## 6. References

- Alba Juez, L., Aragonés, M., López, M. E. & Molina, B. (2006). El Hipermedia en la Educación a Distancia: e-oral, aplicación web para exámenes orales de Lengua Inglesa. In C. Sosa (Ed.) *Anales de Córdoba Learning 2006*. Córdoba (Argentina): Kluster Kairos.
- Arines, F. (2008). *Improving English pronunciation through songs* (MA Dissertation). Universidad Nacional de Educación a Distancia (UNED), Madrid.
- Baker, T. J. (2012). "MOOC pedagogy: Theory & practice," *Profesorbaker's ELT Blog* (1 October). Retrieved from <http://profesorbaker.com/2012/10/01/mooc-pedagogy-theory-practice/>, accessed 27 September 2019.
- Barreiro, S. Estebas Vilaplana, E. & Soto, I. (2005a). Teaching Phonetics through singing and reciting. *Phonetics Teaching and Learning Conference 2005*. London: University College London. CD-Rom.
- Barreiro, S. Estebas Vilaplana, E. & Soto, I. (2005b). Acoustic characterization of reciting and singing in a non-native language. In *Proceedings of the III Congreso de Fonética Experimental* (pp.131-140). Santiago de Compostela: Universidad de Santiago.
- Castrillo, M.D. (2014). Language Teaching in MOOCs: the Integral Role of the Instructor. In E. Martín-Monje & E. Bárcena (Eds.), *Language MOOCs. Providing Learning, Transcending Boundaries* (pp. 67-90). Warsaw: De Gruyter Open.
- Castrillo, M.D. & Martín-Monje E. (2018). Learning English for Professional Purposes at university and through a MOOC. A case study. In T. Read, S. Montaner, & B. Sedano (Eds.), *Technological Innovation for Specialized Linguistic Domains: Languages for Digital Lives and Cultures. Proceedings of TISLID'18* (pp. 295-306). Mauritius: Éditions universitaires européennes.
- Cruttenden, A. (2008). *Gimson's Pronunciation of English*. (7<sup>th</sup> ed.). London: Hodder Education.
- Domínguez, D. & Álvarez, J.F. (2019). Structural Changes in the Landscape of Spanish Distance universities. *Open Praxis*, 11(2), 119–128. <https://doi.org/10.5944/openpraxis.11.2.958>
- Dörnyei, Z. (2009). The 2010s. Communicative language Teaching in the 21st Century. The "Principled Communicative Approach". *Perspectives*. 36 (2), 33-43.
- Estebas-Vilaplana, E. Barreiro, S. & Soto, I. (2006). From Prosody to Sounds: a New Approach to Phonetics Teaching and Learning. In *Proceedings of the XXIV Congreso de Asociación Española de Lingüística Aplicada*. Madrid: UNED.
- Estebas-Vilaplana, E. (2009). *Teach Yourself English Pronunciation*. Madrid: UNED.
- Estebas-Vilaplana, E. (2019). *Teach Yourself English Phonetics*. Madrid: UNED.
- Frensch, P. A. (1998). One Concept, Multiple Meanings: On How to Define the Concept of Implicit Learning. In M. A. Stadler & P. Frensch A. (Eds.), *Handbook of Implicit Learning* (pp. 47–104). London: Sage Publications.
- Hayes, N. A. & Broadbent, D. E. (1988). Two Modes of Learning for Interactive Tasks. *Cognition*, 28(3), 249-276.
- Jenkins, J. (2000). *The Phonology of English as an International Language*. Oxford: Oxford University Press.

- Latinjak, A.T. (2014). Aprendizaje implícito y explícito: entre el hacer y el comprender. In V. López-Ros, & J. Sargatal (Ed.), *El aprendizaje de la acción táctica*, 59-85. Retrieved from [http://www3.udg.edu/publicacions/vell/electroniques/VI\\_Jornades\\_aprendizaje\\_accion\\_tactica/docs/05\\_cap3.pdf](http://www3.udg.edu/publicacions/vell/electroniques/VI_Jornades_aprendizaje_accion_tactica/docs/05_cap3.pdf).
- López, M. E., Alba Juez, L., Aragonés, M., & Molina B. (2006). E-oral: A Hypermedia Web Application for English Language Oral Exams within a Distance Education Environment. *Seventh ACIS International Conference on Software Engineering, Artificial Intelligence, Networking, and Parallel/Distributed Computing (SNPD'06)*, Las Vegas, NV, 2006, pp. 343-348. doi: 10.1109/SNPD-SAWN.2006.36
- Martín-Monje, E. & Bárcena, E. (Ed.) (2015). *Language MOOCs. Providing Learning, Transcending Boundaries*. Berlin, Boston: De Gruyter. Retrieved 27 Sep. 2019, from <https://www.degruyter.com/view/product/455678>
- Martín-Monje, E. & Bárcena, E. (2014). Introduction. Language MOOCs: an Emerging Field. In E. Martín Monje, & E. Bárcena (Eds.), *Language MOOCs: Providing Learning, Transcending Boundaries*. (pp. 1-15). Berlin: De Gruyter Open. Retrieved 27 Sep. 2019, from <https://www.degruyter.com/downloadpdf/books/9783110422504/9783110422504.1/9783110422504.1.xml>
- Gil-Jaurena, I. (2015). MOOCs in Spain: Preliminary Lessons from UNED MOOCs Experience. In B. Kim (Coord.). *MOOCs and Educational Challenges around Asia and Europe*, (pp. 191-204). Seoul: KNOU Press.
- Reber, A. S. (1967). Implicit Learning in Artificial Grammars. *Journal of Verbal Learning and Verbal Behavior*, 6(6), 855-863.
- Rossetti, Y. & Revonsuo, A. (eds.). (2000). *Beyond Dissociation: Interaction between Dissociated Implicit and Explicit Processing (Vol. 22)*. Amsterdam: John Benjamins Publishing.
- Roach, P. (2009). *English Phonetics and Phonology*. (4<sup>th</sup> edition). Cambridge: Cambridge University Press.
- Sun, R., Slusarz, P. & Terry, C. (2005). The Interaction of the Explicit and the Implicit in Skill Learning: A Dual-Process Approach. *Psychological Review*, 112(1), 159-192.
- Walker, R. (2011). *Teaching the Pronunciation of English as a Lingua Franca*. Oxford: Oxford University Press.

## The Digitalisation of Study Process from Perspective of Academics

### Raimonds Strods

University of Latvia Faculty of Education, Psychology and Art, Latvia  
Raimonds.Strods@lu.lv

### prof. Linda Daniela

University of Latvia Faculty of Education, Psychology and Art, Latvia  
Linda.Daniela@lu.lv

### prof. Zanda Rubene

University of Latvia Faculty of Education, Psychology and Art, Latvia  
Zanda.Rubene@lu.lv

### Abstract

Latvia and France's Hubert Curien partnership programme 'Osmoze' is currently carrying out the cooperative research project "The gap between political development documents and practice of digitalisation of higher education" and the results of the project will be presented in this paper. The results reveal the competence of academics to carry out a study process that is relevant to the current trends in higher education (HE) digitalisation. A mixed research design was implemented to achieve the goal of the study. In the first stage of research, the authors identified three groups of documents for analysis: 1) laws, regulations and procedures governing HE in Latvia; 2) Latvian development and planning documents; and 3) legislative documents governing HE in Europe. An inductive approach for qualitative content analysis was implemented to determine what needs to be done by academics in the context of HE digitalisation. At the political level, academics should be able to use various ICT within the framework of the study process, implement blended learning, as well as create digital learning materials to help students acquire the competence needed for today's labour market. Based on the results of the qualitative content analysis, a questionnaire was prepared, and the target group of academics answered what knowledge, skills and attitudes should be combined in order to implement blended learning, and also evaluated the digitalisation aspects of their HE institutions. The data set was aggregated and combined with the skills that the academics have to possess, as defined in the normative documents, and a tangible model was created that reveals the competence of the academics both as determined at the political level and in practice to carry out the study process according to the digitalisation trends. Finally, recommendations were made for the digitalisation of the study process and to strengthen the competence of academics.

**Keywords:** blended learning, academics competence, digitalisation of higher education.

### 1. Introduction

Academic staff of Higher Education Institutions (HEI) are founders of education innovations. Digital tools offer wide opportunities to improve teaching and learning processes in HEI if innovative education concepts are accepted, additionally, innovative teaching process requires development of new competence of teaching staff. Academics will be able to improve student and, as a result, whole society's capacity to act actively in a digitalised world if technologies are integrated into the study programmes (Schneckenberg, Wildt 2006). At the level of HE political aims and practice, a big gap in the context of digitalisation exists for the integration of technologies is a complex process that requires not only integration of the technologies but, mainly, change of

pedagogical approach in the study process (Thorvaldsen & Madsen, 2018; Strods, Daniela, Gabriel, 2018). Moreover, technologies must be integrated in the study process with the aim for students to gain experience in use of technologies for their personal and professional growth, promote operation of higher cognitive processes and result in higher educational achievements. HE digitalisation should also be evaluated at a political level as the integration of technologies has an economic pressure. Therefore, the authors of the paper have focused on the research of the Bologna process development as it is acknowledged to be the most significant driving force for development of unified European HE space. The researchers conclude that the announcements from first decade of the Bologna process are more politically oriented and applied to structural changes, however, in the recent years conceptual changes that emphasise the pedagogical categories, e.g. development of critical, creative and innovative thinking, peer learning implementation. etc, are observed. Hence, it can be concluded that in the implementation of the Bologna process, transformations from structural changes to pedagogical innovations, change of emphasis from unified HE system creation to unified meaningful quality improvement of study process are taking place. The need for HEI to support academic staff in implementing pedagogical innovations into student-centred study process, as well as to assure the opportunity for academic staff to work in a digitalised study environment and to acquire and discover the potential of digital technologies in teaching and learning processes, have been raised as priorities at the ministerial conferences organised in the last years, in which educational ministers involved in the Bologna process meet to discuss progress and aims for the next planning period. To reach the raised priority, blended learning approach that will improve quality of education and integration of society in digital world is suggested to be implemented into the study process (Yerevan Communiqué, 2015; Paris Communiqué, 2018). By analysing the normative documentation that regulates HE in Europe, the authors of the Paper conclude that blended learning is a stimulating educational approach of HE digitalisation and interpret it as a thought-over and meaningful experience combination of face-to-face and online classes in which a significant role is paid to synchronous and asynchronous study process. The core of blended learning concept is formed by combination of diverse teaching and learning processes, e.g. learning forms (face-to-face, online, self-paced learning), didactical methods and approaches, using various types of media, ICT and e-learning platforms (Garrison, Vaughan, 2008; Garrison, Kanuka, 2004; Graham, Woodfield, Harrison, 2013; Valiathan, 2002; Kerres, De Witt, 2010; Adams, Scheer, Kopp, 2018; Alsaif, et.al., 2019). Encouragement of blended learning approach into study process is a competence of the academics but, in order for the process to be meaningful and for benefits related to the HE approach to be achieved, the implementation process has to be holistic and all HE actors must be involved in it. Therefore, each HE institution must hold a clear vision of how to accomplish blended learning approach at an academic and administration staff levels. An essential input to create the authors' of the Paper understanding about implementation of blended learning approach in the context of an institution was provided by accomplishment of University of Glasgow researchers who affirm that effective institutional transmission to blended learning is definable at three levels: 1) the first level is characterised by interaction between actors of education: students, academic staff and management of HE institution; 2) the second level is characterised by competence (digital, media) of educational actors, mutual communication in evaluation of processes; cooperation in creation of processes and technological solutions, contribution to the management of processes; 3) at the third level mainly the academic staff operate but also the management of HE institutions play an important role. Academic staff select and master topical teaching and learning approaches (aspect of pedagogy); academic staff, in cooperation with the management, update and strengthen the development of innovative culture in the organisation and constitute clear ethical norms (aspect of culture and ethics); the management has to ensure such an infrastructure that allows to create teaching and learning environment rich in technologies (aspect of infrastructure), management of HE institution has to provide management of physical environment, by optimising the use of resources (aspect of management), HE institution management

has to equip the support staff that helps not only to use technologies but also helps academic staff to master new teaching and learning approaches. Besides, transformation towards implementation of blended learning in HE institution is influenced by different factors: changing digital environment, creators of educational politics, internationalisation, stakeholders' expectations (Adekola, Dale, Gardiner, 2017).

Considering the situation with political aims and society demand, academic staff must change not only their way of thinking but also their way of pedagogical practice, including and adapting different new forms and methods of teaching and learning, which are provided by blended learning. At the level of HE practice and politics the term "blended learning" likewise "digitalisation" is used correctly and incorrectly, also gaining the Buzzword meaning, as in a wider scale of education an understanding of what knowledge, skills, values and attitudes academic staff must possess in order to implement blended learning, is missing. In the influence of these factors, the research authors identified a scientific interest to work on finding solution to the problem.

## **2. Methodology**

To answer the research question "what are the fundamental knowledge, skills and attitudes an academic staff must possess in order to implement blended learning" and obtain overall and specific data, a mixed research design was chosen. In the first part of the research the authors analysed three groups of normative documentation: 1. laws, regulations and procedures governing higher education in Latvia; 2. Latvian development and planning documents; 3. legislative documents governing higher education in Europe. Thirty-seven normative documents were analysed, covering 1,089 pages of text. The authors contacted the representative of the Ministry of Education and Science of the Republic of Latvia, Department of Higher Education, Science and Innovation, to identify the most important normative documents governing higher education, thus implementing a purposive sample for selecting documents. Individual words, phrases and sentences, reflecting the digitalisation of higher education, were chosen for the analysis units (Strods, Daniela, Gabriel, 2018). As a result the data was gathered and systemised (see Table 1), that reveal what academic staff must be able to do in the context of HE digitalisation, at a level of political framework. In the second part of the research, a survey was created in which academic staff, by using the Likert scale, assessed various aspects of digitalisation at their HE institution and defined what are the required knowledge, skills and attitudes in implementing blended learning.

## **3. Results**

In the first part of the research, normative documentation was analysed by using an inductive approach to qualitative content analysis (Elo, Kyngäs, 2008). By analysing the normative documentation, the authors gathered all textual resources that refer to the digitalisation of HE and conceptualised them, in order to develop a scheme which characterises tendencies of HE digitalisation in the context of political aims, that has already been published (Strods, Daniela, Gabriel, 2018), but the original data that reflect what academic staff must be able to do in the study process digitalisation are presented in this article.

Table 1: Tasks of academics in the context of digitalisation of the study process raised at a political level.

	Integration of technologies in the study process	Providing digital educational means and resources	E-learning assurance	Learning management system (LMS) assurance	Improvement of academic staff competence
Law On Institutions of Higher Education (LV)	X				
Education Law (LV)		X			
Europe 2020, A strategy for smart, sustainable and inclusive growth	X				
Agenda for the modernisation of Europe's higher education systems (EU)	X	X	X		
Sorbonne Joint Declaration	X				
Prague Communiqué	X			X	
Yerevan Communiqué	X	X			X
Paris Communiqué	X	X			X
Education Development Guidelines (LV)	X			X	X
Science, technology development and innovation Guidelines (LV)	X		X		
National Concept of Development of Latvian Higher Education and Higher Education Institutions (LV)	X	X			
The Information Society Development Guidelines (LV)		X	X	X	X
Sustainable Development Strategy (LV)			X	X	

The necessity of integrating technologies in the study process by academic staff is defined in total in 10 normative documents. No particular technology integration is mentioned in the documents but the latest information and communication technologies are emphasised, however, it is mentioned that integration of technologies in the study process foster digital skills, improve social cohesion, equal opportunities, lifelong and flexible learning and the quality of life (Prague Communiqué, 2001; Paris Communiqué, 2018). In political scene, a task for academic staff to be able to develop digital teaching and learning aids that not only help to interactively acquire the formulated study course content but also to study transversal skills, like information literacy (Education Law 1998; ISDG, 2013) is being set. To enrich the student learning experience, the academic staff must master and use such teaching and learning forms and methods that would help them to organise synchronous and asynchronous e-study processes (European Commission, 2011). Consequently, for the study process not to be attached to a particular physical environment and for students to be able to assess digital learning tools, additional literature and achievable tasks, the academic staff must be able to assure the

operation of Learning management system (SDSL, 2010). Integration of technologies in the study process has to take place in the framework of student-centred and blended learning, therefore, in order to intentionally achieve it, the academic staff have to improve their competence in organisation and management of the study process and attention to it is also being drawn at a political level. Academic staff must acquire educational innovations to be able to reveal the benefits of technology use in the teaching and learning processes (Yerevan Communiqué, 2015; Paris Communiqué, 2018).

In the second part of the research, a structured survey was created that was based on the research results of normative documentation and literature studies about implementing blended learning approach in system of HE institutions (Adekola, Dale, Gardiner, 2017). In the development of survey content, data acquisition and processing, all fundamental principles of research ethics were observed. Both – qualitative data – that reflect the opinion of academic staff about necessary knowledge, skills and attitudes in order to implement blended learning, and quantitative data – in which academic staff assessed the following HE processes in the context of digitalisation at their HE institution were obtained: 1. Technical supply; 2. E-management; 3. Culture and ethics; 4. Support in the use of technology and technological solutions; 5. Digital literacy of students and academics; 6. Study process; 7. Research; 8. Future perspective. The survey was developed in the *Google Sheets* platform and sent to academic staff of HE institutions. The answers were obtained from March until September 2019. In total 163 surveys were attained, 160 of which were agreed to be valid (3 of the academic staff had not filled in the qualitative part of the survey) from 27 countries. The academic staff represent various branches of science, but mostly – Social Sciences (57%); while the division of the other branches of science represented are as follows: Humanities and Art (22%); Engineering and Technologies (16%); Natural Sciences (4%); and Medicine and Health Care Sciences (1%). Eurydice statistics about division of academic staff according to the age group (European Commission/EACEA/Eurydice, 2017) in HE field show similar tendencies to the survey carried out by the authors of the Paper as the division of respondents according to the length of their working experience is as follows: 21 and more years (33%); 11 to 20 years (36%); 6 to 10 years (17%); 3 to 5 years 7%; and Up to 2 years (7%).

The authors of the research concentrate on the analysis of qualitative data in this Paper, whereas the obtained quantitative data (evaluation of HE digitalisation aspects) will be analysed and described in the future publications. The obtained qualitative data about evaluation of most important knowledge, skills and attitudes necessary for implementation of blended learning approach, according to the academic staff, were coded by using the qualitative processing and analysis program MAXQDA 2018. In total 20 codes were created that were used 647 times (the number in brackets show how many times the code was used) and were divided into three parent codes: necessary knowledge, skills and attitudes (see Figure 1).



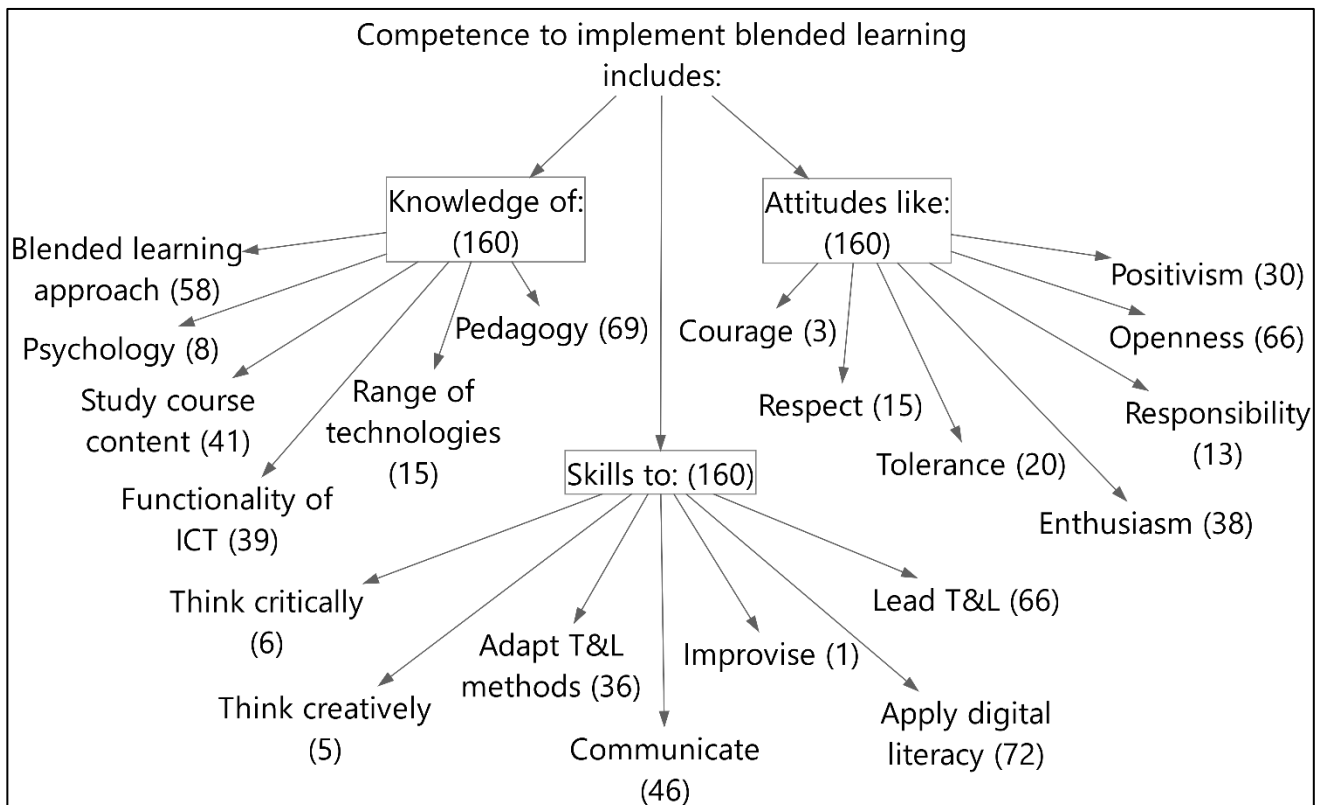


Figure 1: Single-Case Model with Code Hierarchy

“Competence indicate a satisfactory state of knowledge, skills and attitudes and the ability to apply them in a variety of situations” (UNESCO, 2012, pp. 8). By accepting the definition, the authors of the Paper analyse the competence of academic staff to implement blended learning into parent codes: knowledge, skills, and attitude.

*Knowledge.* Majority of academic staff indicate that, firstly, in order to implement blended learning approach in the study process, there must be basic knowledge in pedagogy. Particular knowledge in pedagogy is divided as follows: HE pedagogy and didactics that include student learning styles and generation (X, Y, Z, A) differences, including values; Zone of Proximal Development theory; active learning theory; self-paced learning development; construction of knowledge and evaluation of knowledge; social emotional and engagement strategies, study course design development. The second most widely mentioned knowledge was related to understanding blended learning approach, more precisely, how to organise the study process and student cooperation in LMS; what principles are to be followed in levelling communication intensity to organise student groups, promote motivation; how to create electronic resources for teaching & learning; how to organise learning materials in LMS; how to highlight and emphasise essential information; latest research about blended learning, planning proportion of online and face-to-face classes; being aware of the potential risks; knowing pedagogical approaches to make technologies a study tool and not to divert attention from the study content. A significant role by the academics was assigned to being knowledgeable about their managed study course content indicating that academics have to be experts in their managed study course framework, as well as to have expertise in psychology (about student cognitive, emotional and neurobiological aspects in study process and organisational psychology). The final group – Functionality of ICT and Range of technologies in which the academics included knowledge, what educational technologies and technological solutions are available and what are their functions. Very many examples were named: organisation of online seminars, use of digital applications in study process, use of social networks; survey/test/forum creation and result processing tools;

sharing and cloud services; augmented reality, mixed reality, virtual reality; development and processing visual materials (infographics, video); database opportunities, open educational resources, etc).

*Skills.* According to the academics, the most important component of competence in order to implement blended learning, is digital literacy. With digital literacy the academics understand: ability to use ICT; skills to apply technologies in education; digital educational materials creation; information searching, analysing and synthesising skills; how to develop online and offline course content in LMS, how to integrate this content, how to facilitate communication with and among students online and offline, how to guide and assess individual learning; The other significant skills group is leading the process of teaching and learning and adapting the study methods. As main skills in this group the academics point out: planning of the study process; leadership; evaluating own educational activity and giving feedback about student achievements at the right time; motivating and involving students into an active study process; individualising the study process; finding ways how to cooperate with colleagues and promoting succession of content; linking technology to pedagogical techniques. Traditional full time study methods to be adapted for use in e-study environment; to establish a safe study environment in full time and online studies. The third skills group can be named transversal skills that include skill to communicate (the academics also point out language knowledge for this skill and reveal that communication has to be open, simple and time has to be found for communication online and face-to face, but indicate that there should only be one communication channel in each environment) to think creatively as well as to improvise.

*Attitude.* As the most important attitude in the complex of academic staff competence to implement blended learning, openness is mentioned. Academics ascribe the openness with three aspects: 1) to be open to new teaching and learning methods that can be tried in the study process; 2) openness towards various student needs in the study process; 3) openness in moments when technologies do not work as they were supposed to. The second most important attitude is enthusiasm, which is most appropriately described by a respondent's answer: "*Willing to keep up-to-date on new trends in learning in an ever-evolving digital world.*" Enthusiasm as an attitude and value is particularly emphasised because the academics often explain it as a catalyst that encourages to acquire and carry out blended learning. The academics explain this attitude also as an impulse to continuously study and evolve (by gaining examples from own colleagues and taking part into activities of continuing education), to communicate with students and be available for them as well as to advance new initiatives and development of projects, e.g., be ambassadors of blended learning in own department, faculty of HEI. The academics also highlight such attitudes as positivity and responsibility, which are very precisely characterised in an answer from another respondent: "*A positively realistic attitude towards technologies in general, by being able to see the benefits but also critically assessing the possible risks as the use of technologies cannot be an end in itself.*" According to the evaluation of the academics, it is also important to show courage in situations where there is no experience and knowledge, as well as to show respect towards students and tolerate the diversity of opinions.

Knowledge, skills and attitudes that form the competence of an academic staff to implement blended learning is not particularly divided from other competence of the academic staff, therefore, the authors of the Paper recognise that components of competence necessary for implementation of blended learning can be topical for implementation of other educational approaches.

However, the obtained data is representable and also demonstrates international understanding about academic staff competence to implement blended learning. The authors of the Paper consider that the developed explanation of the competence can serve as basis for evaluation of knowledge, skills and attitudes

of each individual academic staff as well as HEI management in order to evaluate academic staff and help them strengthen the development of blended learning in the context of an institution.

## Conclusions

Digitalisation is the current leading field of HE development. Even though all HE actors must get involved into and take responsibility of digitalisation processes, the authors of the Paper consider academic staff to have the biggest impact on implementation of a meaningful digitalisation process, in the result of which students would be the beneficiaries and educational quality would be improved. By analysing normative documentation that regulate HE quality in Europe and by surveying academics from 27 countries, the authors of the Paper conclude that blended learning is the advancing educational approach of HE digitalisation development. The conclusions about the role of academic staff in HE digitalisation at a political level are as follows:

- It is emphasised that the academics must use the latest information and communication technologies in the study process, but only in some normative documents it is postulated that integration of ICT has to be supported in teaching and learning methods, principles and approaches;
- There are particular normative documents in which an aim to promote strengthening of academic staff pedagogical competence in digitalised study environment is raised, but a step forward should be made and guidelines to assure quality and monitoring of digitalised study process should be developed at a political level.

Based on obtained data from surveys about competence of the academics to implement blended learning, the following conclusions can be drawn:

- The competence of academic staff to implement blended learning in the study process must be rooted not only in knowledge about this approach but also in knowledge about materialisation of student-centred educational paradigm and ICT development, and list of offers in order to apply own digital literacy and find the most suitable ways of how to make ICT a study tool for achieving study results;
- Implementation of blended learning approach is an interdisciplinary process because academic staff must have basic knowledge and skills in pedagogy about organisation, management and evaluation of study process, knowledge in psychology about student cognitive, emotional and neurobiological aspects, knowledge and skills in IT in order to be able to experiment and find best ways of how to use technologies in educational contexts as well as, surely, have to be experts in their represented field of science, because the form of study organisation must be adapted to the study content to be acquired;
- Academics' openness, enthusiasm and positivity are significant attitudes that are considered main catalysts in development of qualitative study process.

In further research, that covers the research of academic staff competence to implement blended learning, it has to be taken into account:

- Research data gives evidence that academic staff create innovations, grounded in own enthusiasm and professional competence but it would be beneficial to study how big role the initiatives of HE institution management have, as well as in assuring support mechanisms for academic staff in the context of innovation creation;
- Even though in normative documentation an opinion that the digitalisation of the study process will be successful if academic staff strengthen their digital literacy prevails, only a skill without knowledge in blended learning approach will not give the expected result, as the process will not be based in

pedagogical regularities. Therefore, it would be beneficial to investigate skills and knowledge mutual input into the process of study innovation application.

- Worth of a research is a focus whether the study content and study organisation form becomes more approachable for students and more efficient for achieving higher study results as an outcome of digitalisation process and/or whether it corresponds to the development tendencies of society and technologies.

#### 4. Acknowledgements

The article was developed within the framework of co-operation between Latvia and France's Hubert Curien partnership programme, "Osmoze" project "The gap between political development documents and real practice of digitalization of higher education" (Registration no. LV-FR/2019/2).

#### 5. References

Adams, S., Scheer, L., Kopp, M. (2018). Transforming Higher Education with Blended Learning: Experiences from a BA Program in Theology Targeting Part-Time Students. *The Online, Open and Flexible Higher Education Conference*, Aarhus Universitet, Denmark, 10-12 October, pp. 301-316. ISBN: 978-90-79730-35-3

Adekola, J., Dale, V.H.M., Gardiner, K. (2017). Development of an Institutional Framework to Guide Transitions into Enhanced Blended Learning in Higher Education. *Research in Learning Technology*, 25, pp. 1-16. DOI: 10.25304/rlt.v25.1973

Alsaif, S. A., Li, A. S., Soh, B., AlZain, M. A., & Masud, M. (2019). From Learning Management Systems to a Social Learning Environment: A Comparative Review and the Implications. *International Journal of Smart Education and Urban Society (IJSEUS)*, 10(1), 1-18. doi:10.4018/IJSEUS.2019010101

Education Law 1998 (LV). Retrieved from <https://likumi.lv/ta/en/en/id/50759-education-law>

Elo, S., Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, vol. 62, no. 1, pp. 107–115. doi:10.1111/j.1365-2648.2007.04569.x

European Commission. (2011). Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions – Supporting growth and jobs – an agenda for the modernisation of Europe's higher education systems 2011 (BE). Retrieved from <https://publications.europa.eu>

European Commission/EACEA/Eurydice. (2017). Modernisation of Higher Education in Europe: Academic Staff –2017. Eurydice Report. Luxembourg: Publications Office of the European Union.

Garrison, R. D., Kanuka, H. (2004). Blended learning: Uncovering its transformative potential in higher education. *The Internet and Higher Education*, vol. 7, no. 2, pp. 95–105.

Garrison, R. D., Vaughan, N. D. (2008). Blended learning in higher education: Framework, principles, and guidelines. San Francisco: Jossey-Bass.

Graham, C. R., Woodfield, W. & Harrison, J. B. (2013). A framework for institutional adoption and implementation of blended learning in higher education. *The Internet and Higher Education*, vol. 18, pp. 4–14.

Informācijas sabiedrības attīstības pamatnostādņem 2014.-2020.gadam/The Information Society Development Guidelines for 2014-2020 (ISDG) 2013 (LV). Retrieved from <http://www.varam.gov.lv>

Kerres, M. & De Witt, C. (2010). A didactical framework for the design of blended learning arrangements. *Journal of Educational Media*, 28(2-3), pp. 101–113. <https://doi.org/10.1080/1358165032000165653>

Latvijas augstākās izglītības un augstskolu attīstības nacionālā koncepcija 2013– 2020. Gadam/National Concept of Development of Latvian Higher Education and Higher Education Institutions for 2013-2020 (NCDLHEHEI) 2013 (LV). Retrieved from [http://www.aip.lv/informativie\\_zinojumi\\_5.htm](http://www.aip.lv/informativie_zinojumi_5.htm)

Law on Institutions of Higher Education (LIHE) 1995 (LV). Retrieved from <https://likumi.lv/ta/en>

Par Izglītības attīstības pamatnostādņu 2014.-2020.gadam apstiprināšanu/Approval of the Education Development Guidelines for 2014-2020 (AEDG) 2014 (LV). Available from: <https://likumi.lv/doc.php?id=266406>

Par Zinātnes, tehnoloģijas attīstības un inovācijas pamatnostādnēm 2014.–2020. Gadam/ Approval of the Science, technology development and innovation Guidelines for 2014-2020 (STDIG) (2014) (LV). Available from: <https://likumi.lv/doc.php?id=263464>

Paris Communiqué. (2018). Ministerial conference in Paris. Retrieved from <http://www.ehea.info>

Prague Communiqué. (2001). Ministerial conference in Prague. Retrieved from <http://www.ehea.info>

Schneckenberg, D., Wildt, J. (2006). Understanding the Concept of eCompetence for Academic Staff. *The Challenge of eCompetence in Academic Staff Development*. Retrieved from <http://citeseerx.ist.psu.edu/viewdoc/summary?doi=10.1.1.457.3464>

Sorbonne Joint Declaration. (1998). Joint declaration on harmonisation of the architecture of the European higher education system. Retrieved from <http://www.ehea.info>

Strods, R., Daniela, L., Gabriel, P. (2018). Analysis of policy planning documents and regulatory enactments from the perspective of digitalization of higher education. *11th annual International Conference of Education, Research and Innovation (ICERI2018)*, Seville, Spain : Conference Proceedings Seville : IATED Academy, pp. 668-674. ISSN 2340-1095.

Sustainable Development Strategy of Latvia until 2030 (SDSL) 2010 (LV). Retrieved from <http://www.varam.gov.lv/lat/pol/ppd/?doc=13857>

Thorvaldsen, S., Madsen, S.S. (2018). The interaction between teacher educators and their students on the use of educational technology: Similarities and differences of attitudes, skills, and practice across a generational change. *The Online, Open and Flexible Higher Education Conference*, Aarhus Universitet, Denmark, 10-12 October, pp. 264-277. ISBN: 978-90-79730-35-3

UNESCO. (2012). UNESCO GUIDELINES for the Recognition, Validation and Accreditation of the Outcomes of Non-formal and Informal Learning. Published by the UNESCO Institute for Lifelong Learning.

Valiathan, P. (2002). Blended learning models. *Learning circuits*, 3(8), pp. 50–59. Retrieved from <http://www.purnima-valiathan.com/wp-content/uploads/2015/09/Blended-Learning-Models-2002-ASTD.pdf>

Yerevan Communiqué. (2015). Ministerial conference in Yerevan. Retrieved from <http://www.ehea.info>

## The "Multiplier Effect" Student E-Tutors Have on Course Instructors to Incorporate Technology in Classrooms

**Simone Adams**

University of Graz, Austria  
simone.adams@uni-graz.at

**Nadine Linschinger**

University of Graz, Austria  
nadine.linschinger@uni-graz.at

### **Abstract**

Digitalization is currently transforming the educational landscape at Higher Education Institutions or HEIs (M. Kopp, Gröbinger, & Adams, 2019) as digital competence has become a crucial skill in the twenty-first century (Newman, Beetham, & Knight, 2018). Therefore, HEIs are confronted with the challenge to adapt their teaching practices by not only incorporating technology into classrooms but also teaching students how to use it. To equip students with necessary digital skills and to digitalize course materials, HEIs adopt various measures, one of them being the training of e-tutors to assist faculty members and teaching staff. The advantages of e-tutoring on students' performance and levels of motivation have been examined and documented before (B. Kopp, Matteucci, & Tomasetto, 2012). However, one aspect that is rarely focused on is the potential impact of e-tutors on course instructors. While initially being supported by e-tutors in their teaching, course instructors may gain knowledge and skills in technology-enhanced learning to be used independently in the future. The University of Graz in Austria established an e-tutoring program in 2018. The program equips student e-tutors with the necessary skills to support course instructors by including learning technologies and digital tools into their courses in a pedagogically meaningful way. This paper explores a potential "multiplier effect" e-tutors may have on faculty after temporarily providing individual support. Using interviews with course instructors and e-tutors, we aim to examine any long-lasting benefits of this approach as well as challenges faced in the first year of the program.

**Keywords:** e-tutor, higher education, faculty development, multiplier effect, pedagogical use of digital tools, technology-enhanced learning

### **1. Introduction**

Digitalization is currently permeating and transforming all areas of society, with education in the digital age being a global concern that demands a variety of action plans, policies, and strategies. In Europe, the far-reaching impact of digital transformation on education can be observed by the large number of EU-wide initiatives and policies that are currently being developed and implemented. Apart from numerous projects funded by Horizon 2020 and Erasmus+ programs, strategies such as the "Digital Education Action Plan" (European Commission 2018) establish a guiding framework for the challenges and opportunities of digital transformation for educational institutions in EU member states.

One key aspect is to equip learners who are growing up with the ubiquity of digital devices around them with necessary digital skills. This starts as early as in primary schools (Kalas & UNESCO Institute for Information



Technologies in Education, 2010) and continues up to higher education institutions (HEIs), where digitalization is currently transforming the educational landscape (M. Kopp, Gröbinger, & Adams, 2019). In other words, digital competence has become a crucial – even though loosely defined – set of skills in the twenty-first century for both teachers and learners (Newman, Beetham, & Knight, 2018). The European Framework for the Digital Competence of Educators ("DigCompEdu"), for example, provides guidelines for policies to assess and develop pedagogical digital competence of educators on national, regional, and local levels (European Commission, 2019). HEIs are thus confronted with the question of how faculty members and teaching staff<sup>1</sup> can adapt their teaching practices by incorporating technology into their classrooms, but also how to teach them the necessary pedagogical and technological skills to use it. In order to equip them with these digital skills and to digitalize courses overall, HEIs adopt various measures.

One such measure is to train faculty members and teaching staff through staff development programs that introduce virtual learning environments (VLEs) and other digital technology for the classroom. This is often a difficult process, however, in part due to lack of time (on behalf of the teachers) and resources (on behalf of the institution). Moreover, training them only on the technological level ultimately has little long-term effects, as "attempts to reskilling of academic staff through half-day workshops in the use of the VLE are unlikely to do more than scratch the surface, and they may also convince faculty that teaching online is mainly about learning to use a computer program" (Salmon, 2011, p. 126). This means that training needs to include the pedagogical use of digital tools, attention to developing technology-enhanced course design that benefits learners' needs, and a focus on changing roles for university teachers who need to develop new skills as e-moderators or online tutors. This kind of training takes time and practice, which very few university teachers are willing and able to invest in addition to their busy teaching schedule, research, and service responsibilities.

To assist faculty members and teaching staff on this path, the University of Graz in Austria established an e-tutoring program for students in 2018. The program equips participating students with skills to support course instructors in including learning technologies and digital tools into their courses in a pedagogically meaningful way. This paper explores the "multiplier effect" that these e-tutors could have on faculty members and teaching staff after temporarily providing individual support. We examine whether course instructors gain knowledge and skills in technology-enhanced learning while being supported by e-tutors in their teaching, and whether they continue to use these skills after the support ends. Studying reflection papers and interview data from e-tutors as well as interview data from course instructors, we aim to ascertain if there are any sustainable benefits of using e-tutors beyond their working relationship with course instructors and whether their expertise has a potential to "multiply." Additionally, we discuss the challenges that were faced in the first year of the program. With the small number of graduates, this case study is only exploratory in nature. Nevertheless, it can serve as a basis for program development and may assist other HEIs when it comes to adopting measures to increase digital skills among their faculty members and teaching staff.

## 2. Background

Reviewing extant literature, it becomes clear that e-tutoring includes a broad variety of responsibilities and roles on the pedagogical, technological, and social level. This starts with aspects of developing technology-enhanced course designs that include the pedagogical use of digital tools (thereby applying a "pedagogy first" approach). On the technological level, e-tutors are responsible for implementing the afore-designed settings

---

<sup>1</sup> In this paper we use the compound *faculty members and teaching staff* as an umbrella term for all types of university teachers, regardless of their rank or type of employment. The term *course instructor* is also used, particularly when put in contrast to the term *e-tutor*, which is not a course instructor/university teacher in our context but a student who participates in our e-tutoring program.



in physical and virtual learning environments. When it comes to the social level, the responsibilities of an e-tutor are primarily "to support individual and collaborative learning processes" and to create a sense of community among learners (B. Kopp, Germ, & Mandl, 2010, p. 225). In their seminal study on how virtual learning can be supported through e-tutoring, Birgitta Kopp, Melanie Germ & Heinz Mandl (2010) define e-tutoring as "all the activities of a teacher that support a learner in constructively and actively dealing with the learning environment" (p. 214). This includes tasks that prepare and organize the learning unit *before* learning takes place and tasks that help to support the learning process *while* learning takes place. In a similar vein, Nadia Sansone, Maria Ligorio, & Sarah Buglass (2016) summarize the key responsibilities of e-tutors as instructors, facilitators, and moderators (p. 14). The broad scope of roles is further exemplified by Ed Hootstein (2002), who claims that e-tutors are constantly wearing "four pairs of shoes" – thus acting (often simultaneously) as instructors, social directors, program managers, and technical assistants.

## 2.1 Terminology

Although the tasks are similar in different educational contexts and countries, there is no consensus on the use of terminology. E-tutors are alternately called online tutors, online coaches, e-moderators, e-trainers, or tele-tutors (B. Kopp, Matteucci, & Tomasetto, 2012). Regardless of the term used, it is either course instructors themselves who are taking on the additional role as e-tutors, or (part-time) online instructors who are hired to assist the lead course instructor(s), especially for large classes in online settings.

In German-speaking countries, however, an e-tutor is usually not a course instructor, that is a member of the faculty or teaching staff, but a student who received training at the HEI to acquire necessary skills in information and communication technologies (ICT) and instructional design in order to support a course instructor with their technology-enhanced teaching (Kneiphoff & Hansen, 2015; Rakoczi, Herbst, & Reichl, 2010; Schratt-Bitter & Frankl, 2012). This development of the term *e-tutor* is probably the result of the word *tutor* being used differently in the German language. At German-speaking HEIs, a tutor is usually a student who works for a course instructor, similarly to a teaching assistant in English-speaking contexts. The term *e-tutor* has thus come to describe a student who supports a course instructor in matters of technology-enhanced teaching. Therefore, any subsequent use of the term *e-tutor* in this paper refers to this role being occupied by a student.

## 2.2 Student E-Tutoring Programs at HEIs

There is a wide variety of e-tutoring programs offered at Austrian and German HEIs. Some train participating students within a few days, some over the course of an entire semester. The content of these courses varies depending on the needs of the university. Topics include aspects of instructional design, e-moderation, multimedia production, accessibility, copyright issues, and open educational resources, among others (Rakoczi, Herbst, & Reichl, 2010; Universität Innsbruck, 2019). While e-tutors may be students registered in a teacher training program (if offered at the HEI), and thus may have some background in pedagogy, this is usually not a prerequisite. What all programs have in common, however, is a practical implementation phase following the theoretical training, where e-tutors in training work together with a course instructor to implement technology-enhanced learning settings into their course design. This collaborative phase may last between one semester and one year. Most e-tutoring programs offer a certificate for the e-tutors upon completion, and the program often counts as an elective with a certain number of ECTS credits that can be taken by all students, no matter their field of study. Some universities then proceed to hire students from the pool of e-tutors to enable support for more faculty members and teaching staff and for a longer period of time (Universität Bayreuth, 2019; Vetmeduni Vienna, 2018).

### 2.3 Student E-Tutoring at the University of Graz

The University of Graz in Austria launched its e-tutoring training program in 2018 as part of the university's e-learning strategy (Universität Graz, 2015). Although the university considers itself a brick-and-mortar institution, with teaching taking place on campus and predominantly face-to-face, there are some initiatives for blended learning programs (Adams, Scheer, & M. Kopp, 2018). Moreover, faculty members and teaching staff are encouraged to enhance their teaching with technology to foster twenty-first century skills such as collaboration, communication, information/media literacy, and creativity among their students. The university even has its own teaching award dedicated to innovative technology-enhanced course designs that serve as blueprints for the effective use of digital media in classrooms. In order to get to a level of technological proficiency, the university regularly offers faculty trainings in the form of half-day workshops as well as personalized coaching sessions. Additionally, the University of Graz participates in (and, in fact, coordinates) a faculty development program on digital competence open to members of the nine HEIs in the Austrian state of Styria ("eDidactics," 2019).<sup>2</sup> Nevertheless, the university is faced with the challenge that a large number of its faculty members and teaching staff is still reluctant when it comes to using digital media in their teaching or merely uses the learning management system (LMS) Moodle as a repository for (digitized) class readings and other course materials.

Overall, teachers at Austrian brick-and-mortar-universities are required (by university laws and guidelines) to teach face-to-face in a physical classroom to fulfil their teaching quotas. Some institutions have recently introduced new regulations that allow for a certain percentage of teaching to be conducted "virtually", i.e. online. At the University of Graz, the last update of the "Satzung" – the university's charter – in 2018 resulted in a new regulation that now allows for a substitution of up to 20 percent of face-to-face teaching with online phases (Universität Graz, 2018). The charter does not specify whether this means synchronous or asynchronous online teaching, offering freedom to design and implement innovative blended learning formats. However, any modification of courses to incorporate technology-enhanced learning naturally requires additional qualifications, efforts, and time that course instructors often do not have or want to invest. Therefore, it was decided to train students to assist university teachers in developing a kind of blueprint for technology-enhanced course designs and serve as e-tutors for classes with hopes that this would increase the use of ICT to assist student learning overall.

The program consists of three consecutive steps and is facilitated by the Center for Digital Teaching and Learning, a service unit at the university that primarily assists course instructors across all six faculties<sup>3</sup> with questions on how technology can enhance classroom experience for both the teacher and the students.<sup>4</sup> The first part of the e-tutoring program requires the e-tutors in training to attend a lecture course and learn about the basics of instructional design and multimedia development, the pedagogical use of digital tools in the

---

<sup>2</sup> The program has a minimum workload of 150 hours for participants and has to be completed within three years.

<sup>3</sup> *Faculties* at the University of Graz are a sub-divisions of the university, grouped by departments of related disciplines (e.g. the Faculty of Law, the Faculty of Natural Sciences, etc.).

<sup>4</sup> This paper is co-authored by two people working at the Center for Digital Teaching and Learning, with one being a student and a graduate of the pilot phase of the e-tutoring program. Conducting this qualitative case study "from within" helps with assessing the strengths and weaknesses of the program in its current form and to find ways to redesign it accordingly. We see our double roles as central agents in the program (program facilitator and e-tutor, respectively) and researchers as enriching for the study and the interpretation of the results. In an attempt to practice methodological rigor and to minimize the possibility of researcher bias when interpreting the data, we performed our coding independently of each other, following Mayring's method of qualitative content analysis, and then compared our results to establish a sense of intercoder reliability (2000).

classroom, Austrian copyright law and creative commons licenses, forms of e-assessment, and digital accessibility. The design of the course is based on an inverse blended learning format (Ebner et al., 2017), with the e-tutors in training being expected to sign up for a Massive Open Online Course (MOOC) on "Teaching and Learning with Digital Media." In this MOOC, students acquire foundational knowledge in the afore-mentioned fields, which is then supplemented by instruction in face-to-face sessions. The final take-home exam for the course expects the e-tutors to practice a form of "experiential learning" (Kolb, 2015) and work on fictional teaching scenarios to put the previously gained knowledge into practice. They are, for example, asked to set up their own learning units or modules on Moodle (focusing on collaboration and e-moderation, not merely on storing class content), create and properly license a learning artifact as an open educational resource, develop and produce a short learning video or screencast, and design interactions using audience response and feedback tools.<sup>5</sup>

Upon completion of the lecture course, the e-tutors develop a project outline for a technology-enhanced course design with a course instructor, in which they apply their previously-gained knowledge to plan media-supported teaching units for a course at the University of Graz. E-tutors are responsible for contacting an interested course instructor, ideally someone they have taken classes with before, and the program facilitator offers placement assistance when needed. Based on the course instructor's needs, the e-tutor designs a blueprint for a technology-enhanced course design that is intended to generally make a course more interactive with the use of digital tools and media. The third and last phase is the implementation of the e-tutor's ideas in the course together with the course instructor and under supervision of the program facilitator at the Center for Digital Teaching and Learning. This practical training phase may last up to one semester with the e-tutor being available to the course instructor for a total workload of 1.5 ECTS credits. In this final phase, the e-tutor may set up the LMS and serve as a forum moderator, design formative e-assessments such as Moodle quizzes to foster autonomous learning among students, come to class to facilitate audience response interactions and feedback sessions, or even help to design and create micro-learning videos for class. After the successful completion of these three phases over the course of a year, the e-tutor receives a total of 5 ECTS credits and a certificate for the e-tutoring training that can serve as an additional qualification in the future, particularly if the e-tutor is enrolled in a teacher training program.

The first run of the e-tutoring program in Graz was completed in February 2019 with five students finishing the pilot phase and becoming certified e-tutors of the University of Graz.<sup>6</sup> Each e-tutor worked closely with a course instructor for one semester, developed a blueprint for technology-enhanced teaching, and implemented aspects of it into a course. In order to evaluate the program and improve it in the future, interviews with e-tutors and course instructors were conducted, the results of which will be presented in the remainder of this article.

### **3. Research Design and Method**

The effects of e-tutoring on students' performance and levels of motivation have been examined and documented before (B. Kopp, Matteucci, & Tomasetto, 2012). One aspect that is rarely focused on, however, is the impact of e-tutors on course instructors. This impact was explored using interview data gathered from

---

<sup>5</sup> Based on our experience with course instructors across the university, these are the key aspects that they need assistance with.

<sup>6</sup> Eight students completed the first phase of the program (i.e. the lecture course), but three dropped out in the second phase, listing personal reasons and/or the high workload for doing so.

e-mail responses to guided questions from both e-tutors and course instructors.<sup>7</sup> For this purpose, two short questionnaires with open-ended guided questions were created, one for each target group. Additionally, permissions were obtained to analyze the e-tutors' project documentation to gain a more comprehensive picture of their experience and their collaboration with course instructors. E-tutors created written documentation throughout the duration of the program, yet the most valuable insight into their experience was the final guided reflections submitted at the end of the program. The interviews with the e-tutors and the course instructors were conducted after the project had ended to not disturb or influence the collaboration during the project. E-mail replies were chosen over a face-to-face interview both for practical reasons (i.e. to be considerate of limited time resources) and to give both parties the opportunity to reflect their thoughts in writing (to match the written project documentation and reflections submitted by the e-tutors).

As mentioned before, the aim of this study was to assess whether there are any long-lasting benefits of the individual support for university teachers and if a "multiplier effect" exists. To this end, all the empirical data was coded and systematically categorized, following Philipp Mayring's approach for qualitative content analysis (2010). A phenomenological approach was subsequently chosen to analyze the data. The interviews and reflections were summarized and grouped to identify themes and common issues of the e-tutoring program. Despite the sample size being quite small, some meaningful insights could be gained, which are presented in the section below.

#### **4. Results**

To assure that our interpretations were not influenced by the responses of the two different groups (e-tutors and course instructors respectively), they were analyzed and coded separately from each other. After this process was complete, the codes were compared with each other to conclude that themes were largely overlapping. Common themes that emerged from interviews with course instructors and students can be categorized into four overall groups:

- (Technology-enhanced) Course design before e-tutor support
- Impact of e-tutor support on course instructors
- Impact of e-tutor support on students
- Implementation of a blueprint for course design & sustainability

Furthermore, some shortcomings of the program were identified by course instructors, which will be addressed in the implication section of this paper. The different perspectives are detailed in the following two sections.

##### **4.1 E-Tutors' Perspectives**

The e-tutors' perspectives were gained by analyzing written reflections and interviews following guiding questions. The latter allowed us to collect perspectives on certain topics of interest and the former enabled the students to share thoughts that may have been blind spots for us. As the interviews with the e-tutors and their reflections show, their motivation to develop a technology-enhanced course design as well as the motivation of their course instructors were quite high. Although some students reported that it was difficult for them to find a course instructor who was willing to collaborate with them and who had the time to do so,

---

<sup>7</sup> The initial idea of using focus groups was discarded, as the risk of the small group of interviewees influencing each other's answers was regarded as too high.

the course instructors who eventually agreed to participate in the program appeared accommodating and happy to collaborate with the e-tutors on equal grounds.

First, the (technology-enhanced) course design of the university teachers prior to the collaboration phase was evaluated. According to the e-tutors' answers, the use of technology-enhanced learning methods varied among course instructors. Most of them used the university's learning management system Moodle, yet the use was usually limited to sharing files and course material with the learners. Some e-tutors were under the impression that the course instructors were hesitant to use supplemental media to assist with their teaching. Others observed that their course instructors were quite skilled in using certain technology, e.g. presentation tools. One reported that despite the course instructor's digital competence being quite high, they preferred to teach without learning technologies. This shows that while the starting situation was different for each e-tutor, their overall impression was that each course instructor had at least some experience with ICT. This indicates that university teachers might need a certain amount of prior knowledge about technology-enhanced learning to be willing to participate in a project like the e-tutoring program.

Next, the e-tutors shared how they felt their support impacted the course instructors. All e-tutors reported that they introduced new tools and/or methods to the course instructors, including audience response systems (ARS) such as Kahoot, Mentimeter, or ARSnova, and Moodle activities, such as tests or forums. One e-tutor wrote that the course instructor was not familiar with audience response systems before but started to use them frequently after being introduced to them. Another e-tutor decided together with their course instructor to create a learning video introducing the course and to publish it on YouTube, thereby sharing the benefits of learning videos and the opportunities of having a YouTube channel for educational purposes.

The e-tutors also felt that they had an impact on the course instructors' knowledge of technology-enhanced learning. One e-tutor said that the course instructor became more practiced with handling Moodle and saw advantages in using it to share materials and activities instead of sending it out via e-mail. According to the e-tutors, multiple course instructors appreciated the opportunities Moodle offered, e.g. sharing thoughts in a forum or creating exercises for students to revise and self-check their learning progress. It should be noted that the e-tutors did not present the e-learning tools as isolated activities but were required to embed them into a meaningful course design. Multiple e-tutors said that they developed a blended learning scenario for their course instructors. One e-tutor, for example, created an outline for an online course unit on digital storytelling. Another stressed the importance of conveying the pedagogically meaningful use of tools and activities, not just instructions on how to use a tool. These answers indicate that the e-tutors, who received some basic training in instructional design, tried to put an emphasis on the pedagogy behind e-learning tools as well.

In addition to the impact of e-tutors on course instructors, the e-tutors' impact on the students was evaluated. Some e-tutors did not only prepare and manage e-learning activities but accompanied the course instructors to class and facilitated activities on site. In doing so, they were able to experience the effects their presence had on the students in class. All e-tutors reported that the students reacted positively to the new technology-enhanced teaching elements of their courses. One wrote that after using an audience response system as a warm-up, the in-class discussion went more smoothly than before. After a section of theoretical input, an online activity helped to increase the focus of the students. Another e-tutor claimed that student participation was higher in sessions where they were present. Moreover, the participation rate for required and optional online tasks was high throughout all courses. One e-tutor designed a task in which the students created their

own videos and reported that the students produced "brilliant" results. This indicates that in addition to the motivational factor, the students could improve their ICT skills too.

The last major theme that surfaced in the interviews was the extent of the implementation of the technology-enhanced course outline and possible sustainable effects created by the e-tutors. Due to the short amount of time the e-tutors had to work on the implementation phase (37.5 hours in total and corresponding to the workload for 1.5 ECTS points) and limited resources of the course instructors, as well as diverging visions for the course, the blueprint was rarely implemented in its entirety. Nevertheless, some e-tutors had the opportunity to realize several of their planned e-learning activities. One wrote that they designed a new Moodle course, which the course instructor decided to keep using in the following semesters. In this case the e-tutor appreciated the chance to "make major changes in the course design" and was particularly happy that the Moodle course would remain in use. This is an example for long-lasting positive effects of the program with the Moodle course created being sustainable as more students can benefit from it in the future. Another e-tutor reported a permanent effect, with their course instructor continuing to use audience response systems in other courses and in research talks. In contrast, the learning video that was created by one e-tutor has no sustainable impact, as it cannot be reused in other courses and the course instructor will likely not start to produce learning videos by themselves due to lacking resources. In some cases, e-tutors stated that course instructors decided against implementing the e-tutors' plans for various reasons. One e-tutor wrote that the course instructor "unfortunately didn't find the time" to make use of their course design. Another project was supposed to be large-scale, exceeding one single course, but the required resources and the approval of the department were missing, which prevented the implementation. This shows that the institutional conditions are a crucial factor that should not be neglected, as they greatly influence success or failure of a project. That is to say, if the conditions are not right, there is likely no lasting or sustainable effect of the support by the e-tutor, no matter how good the training.

#### **4.2 Course Instructors' Perspectives**

Looking at the interview results from course instructors, the self-assessment of their technology-enhanced course design largely matched the assessments by e-tutors. Course instructors who volunteered their participation in the program considered themselves already somewhat familiar with possibilities of TEL scenarios for teaching and had some (moderate) experience with Moodle and digital tools in the classroom. Their course design included a mostly unidirectional use of the LMS in the form of turning it into a content repository and place for course materials and announcements. Additionally, course instructors and teaching staff were accustomed to utilizing platforms such as YouTube to incorporate relevant multimedia content, either for instruction or as a discussion starter. Some expressed a limited willingness to use technology for interaction, for example through discussion forums in which students were required to post reflections on course readings. Overall, however, there was a seeming lack of awareness for the necessity of continuous e-moderation in online discussions, the potential of audience response tools for face-to-face sessions, and the benefits of autonomous online self-assessments for students' learning efforts. Even the use of a collaborative writing tool was considered as too difficult to implement by one course instructor and was thus discontinued due to technical and organizational problems. Whereas some course instructors considered themselves relatively competent in the use of digital media, others acknowledged that they did not have the technological skills to experiment with teaching methods using digital tools. Apart from lacking skills, the lack of time was mentioned several times as a main reason for why not more technology was used in the past.

The time factor was picked up again when it came to the impact of e-tutor support on course instructors. Having e-tutors at hand to set up the LMS for a course, which includes designing activities such as forums and



quizzes, was regarded as an asset, especially if the course instructor felt they had no time for these tasks themselves. Additionally, course instructors mentioned a variety of other aspects that they found beneficial. These included appreciating the opportunity to simply exchange ideas, which was considered fun and motivating as well as a valuable experience overall, and appreciation for the fact that they could present an idea to the e-tutor who would come up with creative and innovative solutions for technological implementation. Even the chance to act as a formal and informal mentor to the e-tutors was listed as a positive. In one case the mentorship, for example, resulted in a B.A. thesis on the topic of digital teaching and learning. The exposure to new tools (and in some cases new methods) was another aspect that was frequently mentioned among the things that impacted teachers. Some talked about having a wider spectrum of exercises at hand once the collaboration phase finished, which they could use to better address their heterogeneous groups of learners. This ranged from different forms of autonomous online self-assessment to peer feedback done online. The biggest impact seems to have been reached if the e-tutor was also familiar with the subject taught, that is, if they had taken the class before and were subject matter experts in their own right. Course instructors labeled this fact as both "positive" and "helpful" when it applied to the e-tutor and as disadvantageous when it was lacking. This is an important observation for future collaborations because not always do e-tutors find interested course instructors from their own area of study or with whom they have taken classes before.<sup>8</sup> In two cases the e-tutor was already working for the course instructor as a teaching assistant, which was an additional factor that benefitted the working relationship. Overall, the responses indicate that the impact of the e-tutor support on course instructors was considered highly positive, if perhaps not as sustainable as we had hoped. This will be discussed later.

The impact of e-tutor support on students was regarded as similarly positive and – at times – quite enthusiastically praised. One course instructor believes that the performance of students "decidedly improved" with the e-tutor present, another talked about a "qualitative improvement of the course" and considers the e-tutor's work an "enhancement" of the class. Students reportedly had the opportunity to practice for their exams through different forms of e-assessment on Moodle as well as benefitted from peer feedback, not just from their colleagues but also from the e-tutor. Yet not all course instructors believed that students necessarily gained *new* digital competence; at the same time, they recognized that their classes have become more interactive with media use and now tend to foster autonomous learning through self-assessments online. There was, of course, some critique too. While quizzes were generally seen as positive to "activate" and engage students, one course instructor questioned their usefulness for the students' learning progress, though acknowledging that they themselves may not have put enough time into the design of the quiz format and questions.<sup>9</sup>

Time was, in the end, also a major factor when it came to the assessment of the program's sustainability and implementation of the created course blueprints. When e-tutors designed ideas for creating digital learning artifacts or online activities that were easily adaptable or ready to be used in subsequent semesters, course instructors were ready to continue using them and appeared open to making technology-enhanced learning a more constant aspect of their teaching design. When activities or artifacts were not easily transferable, the lack of time to create them without e-tutor support was sometimes listed as a reason for not using technology-enhanced learning designs. One course instructor revealed that they actually used less technology in the

---

<sup>8</sup> In fact, one of the e-tutors who dropped out late in the program was not a subject matter expert and we are led to conclude that this was at least in part the reason for them not completing the program.

<sup>9</sup> This skepticism of e-assessments, particularly if they contain multiple choice questions and include an aspect of gamification, is not unusual among course instructors of certain disciplines, and certainly has its merits based on what Philippe Wampfler labeled the "quizification" of digital education (2017).



semester following the e-tutor support, in part because they realized that the additional workload necessary for a positive outcome for the students when using TEL designs was not something they could take on at the time. This is both a negative and a positive, of course, the latter being related to the course instructors' (new) understanding that mastering technology alone is not enough. One course instructor pointed out that the blueprint for the e-tutor's course design did not match what they had in mind for their class and thus could not be put into practice. Regardless of the reasons for this mismatch of ideas for the course design or possible problems in the communication process, this indicates a case in which the e-tutor was not able to adequately support the course instructor in the way the program was intended. The same course instructor expressed skepticism towards the e-tutors' capability for creating a course design with a "pedagogy first" approach in mind, as they perceived the e-tutor's knowledge of digital media profound, but their expertise in pedagogy somewhat lacking. This was a singular viewpoint among the course instructors, however, with others expressing no such concerns. At the same time, it is a fact that e-tutors do not have any (or only very little) teaching experience and thus can only assist course instructors with the skills that they acquire during the program. Ultimately, any pedagogical decisions are not intended to be made by the e-tutor alone, yet it is interesting that in at least one instance this seemed to have been expected to a degree.

## 5. Implications

E-tutors are a valuable addition to courses that use technology-enhanced learning designs. Their positive impacts on students are not only documented in previous research but became also apparent through the empirical data gathered in the study at hand. Overall, students seem to be more engaged and motivated to participate in class as well as online when an e-tutor is present. Particularly the opportunity for students to practice autonomous and self-paced learning through different forms of formative e-assessments and peer review exercises can be considered clear benefits. When e-tutors introduce new digital tools and methods, this goes hand in hand with equipping students with digital skills, another lasting impact of the program.

Whether or not the e-tutoring program also has a sustainable impact on the participating course instructors, however, is a much more complex matter. As the analyzed interviews and reflections show, the impact of e-tutor support on course instructors varies greatly, depending on the expectations and resources of the course instructor, the situational conditions, and the ideas of the e-tutor. Even though some projects seem to create lasting effects with course instructors using templates for course designs or new skills for other courses, other projects could not be realized at all or do not serve as a catalyst for the transfer of digital skills for various reasons. When blueprints for course designs do not have the anticipated outcome or bring immediate benefits, this may be attributed to the fact that implementing technology-enhanced learning and (re-)designing of courses takes some time – and often more than one iteration of the ADDIE cycle<sup>10</sup> – to make sure that pedagogy and technology properly align to assist students in their learning, rather than using technology only in isolated instances or "for technology's sake".

Complicating things further, there was often a bit of discrepancy in expectations when it came to the tasks the e-tutors would fulfill. E-tutors can only be responsible for designing and setting up the activities from a technological perspective (while having pedagogical aspects in mind, of course). Yet as students, they neither have the competence nor can it be their responsibility to develop content for the courses. In other words, the content for each new activity needs to be prepared by the course instructor or another member of staff, not by the e-tutor. This, however, is sometimes expected, particularly if course instructors are pressed for time.

---

<sup>10</sup> The ADDIE model is well-known in instructional design, comprised of the five phases that make up the acronym: analysis – design – development – implementation – evaluation.

With the implementation phase being assigned only 1.5 ECTS points in the program, the e-tutors' time for actual implementation is limited to 37.5 hours. This is not all that much, considering that students are sometimes asked to come to class to assist with activities using digital media or to take on the role of an e-moderator on Moodle. These tasks further demonstrate varied expectations that the e-tutor can only meet partially at best.

With the course instructors being experts in their respective subject areas, and the e-tutors assisting with matters of technology and – to a certain extent – instructional design and pedagogy, a division of tasks is inevitable. Heather Kanuka warns that, "when instructional designers are pedagogical experts but not content experts—and the course instructors are content and research experts but not pedagogical experts—the result is a bifurcation of content and pedagogy" (2006, p. 9). This is precisely the idea – and the problem – of the e-tutoring program at the University of Graz. In an ideal world, the course instructor would be able to embody the three levels of content, pedagogical, and technological expertise. As this is usually not the case in the reality of brick-and-mortar universities, e-tutors are utilized to bridge these fields. The course instructors' feedback shows that it is conducive to the working relationship when the e-tutor is also familiar with the subject taught. The e-tutors who concurrently serve as the course instructors' teaching assistants thereby allow for the most fruitful collaboration. This should be kept in mind when deciding which organizational unit of the HEI will be responsible for the appointment of trained e-tutors after completion of the program to provide more longitudinal support. It may be a viable option to hire the e-tutors in the department (or faculty) of their field of study, instead of hiring e-tutors at the central (administrative) unit that provides the e-tutoring training.<sup>11</sup> It seems like a centralized hiring method might contribute to the afore-mentioned "bifurcation of content and pedagogy", while hiring e-tutors directly in the departments where they are studying seems to be an option to bring these areas closer together.

Regardless of where e-tutors are hired upon completion of the program, high fluctuation among the e-tutors is a likely problem in both scenarios. As the first round of the program shows, many students choose to take the lecture course only and then drop out of the program. Others complete the e-tutoring training program but are not available for employment at the university afterwards. Various reasons for the latter may include certified e-tutors having a different job already, going abroad, or simply graduating shortly after finishing the program. While the e-tutors acquire sustainable benefits from the skills they acquire throughout the training, the university's long-term benefit is not guaranteed, as the e-tutors themselves might not be interested in acting as "multipliers" for course instructors beyond the duration of the program.

## 6. Conclusion

HEIs are faced with multiple challenges that come with digitalization of education. At the University of Graz, a brick-and-mortar institution, one big challenge is to find ways to engage more faculty members and teaching staff in meaningful ways to implement technology-enhanced learning designs into their classrooms. Course instructors at HEIs often do not have the resources or competence to create a technology-enhanced course design on their own, which is where e-tutors are utilized to offer support. After the first year of the e-tutoring program, which trains students to assist course instructors with matters of ICT pedagogy and TEL design, interviews with the participants of the program suggest that it is difficult to create a "multiplier effect" with e-tutor support for course instructors in the program's current form. Due to the availability of e-tutor support for merely one semester and just one course per e-tutor, the program is not designed to offer any longitudinal support for the individual course instructor. This, however, is apparently something that some course

---

<sup>11</sup> This remains undecided at the University of Graz at this point.

instructors would need to become convinced that their time and efforts put into re-designing a course to include TEL designs pay off.

One way of achieving this longitudinal support would be to hire e-tutors upon completion of the program for an entire faculty or for an individual department where they are needed and where they fit with their subject area expertise. This would ensure that skilled and experienced e-tutors are available to more than one interested course instructor. Hiring their regular tutors (i.e. teaching assistants) from the pool of certified e-tutors is another route that faculties and departments could pursue. Even with these options at hand, investing in the training and subsequent hiring of e-tutors on behalf of an HEI is a long-term (and costly) commitment to bring long-term results. It will take more iterations of the program and more systematic research to assess the longitudinal benefits for faculty members and teaching staff. It is clear that the program has great potential for all parties involved – e-tutors, course instructors and the HEI as a whole – but ultimately it requires long-term commitments of all these parties for a program like this to be successful and sustainable.

## 7. References

- Adams, S., Scheer, L., & Kopp, M. (2018). Transforming Higher Education with Blended Learning: Experiences from a BA Program in Theology Targeting Part-Time Students. *Conference Proceedings: Blended and Online Learning*, 301–316. Retrieved from <https://conference.eadtu.eu/download2468>.
- Ebner, M., Khalil, M., Schön, S., Gütl, C., Aschemann, B., Frei, W., & Röthler, D. (2017). How Inverse Blended Learning can Turn Up Learning with MOOCs? *Proceedings of the International Conference MOOC-MAKER 2017*, 21–30.
- eDidactics. (2019). Retrieved from <https://edidactics.at>.
- European Commission. (2019, July 3). Digital Competence Framework for Educators (DigCompEdu). Retrieved from <https://ec.europa.eu/jrc/en/digcompedu>.
- Hootstein, E. (2002). Wearing Four Pairs of Shoes: The Roles of E-Learning Facilitators. In M. Driscoll & T. Reeves (Eds.), *Proceedings of E-Learn 2002-World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education*, (pp. 457–462). Retrieved from <https://www.learntechlib.org/primary/p/15260/>.
- Kalas, I., & UNESCO Institute for Information Technologies in Education. (2010). *Recognizing the potential of ICT in early childhood education: Analytical survey*. Retrieved from <https://unesdoc.unesco.org/ark:/48223/pf0000190433>.
- Kanuka, H. (2006). Instructional Design and eLearning: A Discussion of Pedagogical Content Knowledge as a Missing Construct. *E-Journal of Instructional Science and Technology*, 9(2). Retrieved from <https://eric.ed.gov/?id=EJ846720>.
- Kneiphoff, A., & Hansen, H. (2015). "Ich fühle mich zehn Jahre weiser" —Studentische Beteiligung in zentraler E-Learning-Beratung. *Zeitschrift Für Hochschulentwicklung*, 10(2), 111-123. <https://doi.org/10.3217/zfhe-10-02/08>.
- Kolb, D. A. (2015). *Experiential Learning: Experience as the Source of Learning and Development* (2nd ed.). Upper Saddle River, NJ: Pearson Education.

- Kopp, Birgitta, Germ, M., & Mandl, H. (2010). Supporting Virtual Learning through E-Tutoring. In B. Ertl (Ed.), *E-Collaborative Knowledge Construction: Learning from Computer-Supported and Virtual Environments* (pp. 221–231). Retrieved from [https://www.researchgate.net/publication/249753468\\_Supporting\\_virtual\\_learning\\_through\\_e-tutoring](https://www.researchgate.net/publication/249753468_Supporting_virtual_learning_through_e-tutoring).
- Kopp, Birgitta, Matteucci, M. C., & Tomasetto, C. (2012). E-tutorial support for collaborative online learning: An explorative study on experienced and inexperienced e-tutors. *Computers & Education*, 58(1), 12–20.
- Kopp, M., Gröbinger, O., & Adams, S. (2019). Five common assumptions that prevent digital transformation at Higher Education Institutions. *INTED2019 Proceedings*, 1448–1457. Valencia.
- Mayring, P. (2000). Qualitative Content Analysis. *Forum: Qualitative Social Research (FQS)*, 1(2). Retrieved from <http://www.qualitative-research.net/index.php/fqs/article/view/1089/2385>.
- Mayring, P. (2010). *Qualitative Inhaltsanalyse: Grundlagen und Techniken* (7th ed.). Weinheim: Beltz.
- Newman, T., Beetham, H., & Knight, S. (2018). Digital experience insights survey 2018: Findings from students in UK further and higher education. *Jisc*. Retrieved from [http://repository.jisc.ac.uk/6967/1/Digital\\_experience\\_insights\\_survey\\_2018.pdf](http://repository.jisc.ac.uk/6967/1/Digital_experience_insights_survey_2018.pdf).
- Rakoczi, G., Herbst, I., & Reichl, F. (2010). Nine Recommendations for Enhancing e-Moderation Skills by Utilisation of Videoconferencing within an e-Tutoring Curriculum. *Proceedings of ED-MEDIA 2010*, 2258–2266. C. Montgomerie, J. Herrington, B. Hunter (Ed.); Association for the Advancement of Computing in Education (AACE).
- Salmon, G. (2011). *E-Moderating: The key to teaching and learning online*. New York, NY: Routledge.
- Sansone, N., Ligorio, M., & Buglass, S. (2016). Peer e-tutoring: Effects on students' participation and interaction style in online courses. *Innovations in Education and Teaching International*, 55(1), 13–22. <https://doi.org/10.1080/14703297.2016.1190296>.
- Schratt-Bitter, S., & Frankl, G. (2012). Evaluation of blended learning courses The assessment of the e-tutors. In *ICL 2012—Conference Proceedings*. <https://doi.org/10.1109/ICL.2012.6402132>.
- Universität Bayreuth. (2019). Ausbildung von E-Tutor\*innen. Retrieved from <https://www.fbzhl.uni-bayreuth.de/de/digitaleressourcen/etutorinnen/index.html>.
- Universität Graz. (2015). E-Learning Strategie der Universität Graz 2015–2018. Retrieved from [https://static.uni-graz.at/fileadmin/digitales-lehren-und-lernen/Dokumente/E-Learning\\_Strategie\\_FINALVERSION.pdf](https://static.uni-graz.at/fileadmin/digitales-lehren-und-lernen/Dokumente/E-Learning_Strategie_FINALVERSION.pdf).
- Universität Graz. (2018). Satzungsteil Studienrechtliche Bestimmungen. Retrieved from [https://static.uni-graz.at/fileadmin/Rechtsabteilung/Dateien/Satzung\\_Studienrechtliche\\_Bestimmungen\\_2018.pdf](https://static.uni-graz.at/fileadmin/Rechtsabteilung/Dateien/Satzung_Studienrechtliche_Bestimmungen_2018.pdf).
- Universität Innsbruck. (2019). Informationen zur LV "E-Tutorin @UIBK." Retrieved from <https://www.uibk.ac.at/elearning/fortbildung/etutorinnen/>.

Vetmeduni Vienna. (2018). Die E-TutorInnen-Ausbildung geht im WS 2018/19 in die nächste Runde.  
Retrieved from [https://vetucation.vetmeduni.ac.at/data/projekte/news/2018/E-TutorInnen\\_Info\\_fuer\\_Studierende\\_2018.pdf](https://vetucation.vetmeduni.ac.at/data/projekte/news/2018/E-TutorInnen_Info_fuer_Studierende_2018.pdf).

Wampfler, P. (2017). Der Kahoot-Sog und die Gefahr der Quizifizierung der digitalen Bildung. *Fnm Magazin*, (02/2017). Retrieved from <https://www.fnma.at/content/download/740/2628>.

## Towards a short learning program on online learning at the Open University of the Netherlands

### Iwan Wopereis

Open University of the Netherlands, the Netherlands  
iwan.wopereis@ou.nl

### Kees Pannekeet

Open University of the Netherlands, the Netherlands  
kees.pannekeet@ou.nl

### Tom Melai

Open University of the Netherlands, the Netherlands  
tom.melai@ou.nl

### Kathleen Schlusmans

Open University of the Netherlands, the Netherlands  
kathleen.schlusmans@ou.nl

### Rieny van den Munckhof

Open University of the Netherlands, the Netherlands  
rieny.vandenmunckhof@ou.nl

### George Moerkerke

Open University of the Netherlands, the Netherlands  
george.moerkerke@ou.nl

### Abstract

This paper presents an evaluation of a series of six learning units on online learning that was developed by the Open University of the Netherlands and offered free of charge to educational professionals in the Netherlands and Belgium. Each unit (called 'micro module') had a study load of two to four hours and addressed didactical, technological, and managerial issues related to designing, developing, and implementing online education. Professionals in the educational domain showed interest in the micro modules. Over 2400 educational experts indicated in an inventory that they were willing to attend the series. In the end, approximately 1200 professionals participated in one or more modules. Participation decreased from about 900 participants in the first micro module (a general introduction on online education) to about 200 in the last (a module on research on online education). Approximately 120 professionals participated in all modules. Participants were positive about the content. Average ratings on content quality ranged from 6.9 to 7.9 (on a ten-point scale). The design, development, and implementation of the micro modules had to be completed in a short period of time, and therefore a rapid and agile instructional systems design (ISD) approach had to be applied. Although such an approach puts considerable pressure on the organization, it is essential for a swift implementation of state-of-the-art small learning units. Results of the evaluation on both products (i.e., quality of the micro modules) and processes (i.e., quality of ISD) will be the reference for the transformation of these micro modules into a certified short learning program.

**Keywords:** online learning, distance education, short learning program.

## 1. Introduction

Online learning, or 'instruction delivered on a digital device that is intended to support learning' (Clark & Mayer, 2016; Mayer, 2019), is the main constituent of educational programs provided by contemporary universities for distance learning. At the Open University of the Netherlands (OUNL) it features the new educational model, which stresses 'active online learning' as didactic approach (Koper, 2014; Schlusmans, Van den Munckhof, & Nielissen, 2016). For some years now, the university has aimed to deliver all its courses according to the new model of 'active online education'. This ambition has resulted in a large institutional knowledge base on the realization of online learning environments. Since it is an important mission of the OUNL to contribute to the innovation of the Dutch educational system, sharing this knowledge base with educational professionals in the field seems to be a logical next step. Therefore, offering a series of short, thematically structured open learning units to the educational field was regarded as an opportunity to achieve this.

This paper discusses the design, development, and implementation of such a series of open learning units, which were called 'micro modules' due to their intended size and scope. We describe and evaluate both processes (i.e., analyses, design, development, and implementation) and products (i.e., micro modules) and use the ADDIE approach (Branch, 2009) to structure the description and evaluation of results. Before we present this, we briefly elaborate on the micro modules and their relationship to other short and open learning initiatives to provide the reader with a frame of reference.

The idea to offer an open series of micro modules emerged during a brainstorming session in the university's higher management. In close collaboration with Academic Affairs, the Centre of Education and Teacher Professional Development (ECOP in Dutch) adopted the idea and developed it into an agile-like project (cf. Adnan & Ritzhaupt, 2018). This project resulted in a series of six micro modules that addressed online learning topics related to didactics (e.g., active learning), technology (e.g., virtual reality and virtual classrooms), and research (e.g., learning analytics). Table 1 summarizes the structure and content of the six micro modules.

Table 1: Six micro modules on active online education (OE) offered in 2019.

Name	Content	Release date
1. What is OE?	Definitions and experts' opinion on OE	February 2
2. Activating in OE	Didactics and instructional design related to OE	February 18
3. Virtual reality (VR) in OE	VR theory and hands-on experience	March 4
4. The virtual classroom (VC)	VC theory and hands-on experience	March 18
5. Assessment in OE	Integrating online testing in OE	April 8
6. Research on OE	Overview of current trends in OE research	April 29

Note: see <https://www.ou.nl/micromodules> (information in Dutch).

The micro modules were delivered free of charge to the participants by yOUlearn, the university course management system (Hermans, Kalz, & Koper, 2014; Vogten & Koper, 2018). To some extent the entire set of six modules were similar to a massive open online course (MOOC; Deimann, Lipka, & Bastiaens, 2015; Henderikx, Kreijns, & Kalz, 2017; Kop, Fournier, & Mak, 2011; Magaryan, Bianco, & Littlejohn, 2015). Like a modern MOOC (a) the instructional guidance of participants for units of learning was constrained to a relatively short time period (in our case 1-2 weeks for each module), (b) education consisted of building blocks of equal size (in our case 2-4 hours study load each), (c) the series promoted online interaction between participants, instructors, and content (e.g., by means of discussion forums, blogs, virtual classroom sessions), and (d) the number of participants for each module decreased (in our case appr. n=900 started with the first module and appr. n=200 with the sixth module). Although the set of modules was limited in size (cf. 'short', 'small', 'micro'),



in this form they cannot, as yet, be characterized as a short learning program or SLP as defined by the European Association of Distance Teaching Universities (EADTU). EADTU uses criteria that the current design doesn't meet, such as (a) offering some kind of certification, (b) aiming instruction on complex skill learning or competence development (instead of knowledge acquisition), and (c) –as a consequence of the latter– demanding a study load of at least 5 ECTS Credits (EC) or approximately 140 to 150 hours (EADTU, 2016, Thaler & Bastiaens, 2017). However, based on the unexpectedly high interest of the educational field in the micro modules, the transformation of them into a certified SLP on online learning is currently planned for.

The remainder of this paper evaluates the micro modules and addresses initial ideas about an SLP on online learning. We will first describe the needs analysis that formed the basis for the selection of instructional topics. Secondly, the design, development, and implementation of the micro modules will be elaborated upon (the DDI of ADDIE, see Branch, 2009). Thirdly, descriptive statistics regarding participation and content quality will be presented in an overall evaluation section. Finally, we will reflect on the instructional systems design (ISD) processes and address the aforementioned transformation of modules into an SLP.

## **2. Needs analysis**

An important step was to involve potential participants in the design process (co-creation; see Moerkerke, 2015). At the end of 2018, this group was asked to fill in an online questionnaire on the expectations of the initial setup and content of the micro modules (cf. learning needs).

About 150 potential participants filed about 350 statements on what they wanted to learn. Important topics raised were (a) choosing/not choosing (aspects of) online learning in face-to-face education (e.g., when to instruct online and when to instruct face-to-face), (b) the effectiveness of online education, (c) student engagement in online education, (d) student collaboration in online education, (e) implementing online education in face-to-face curricula (e.g., how to persuade and learn teachers to teach online), (f) online assessment, and (g) online tool use. Based on the needs analysis initial topics for the micro modules were redefined and refined (see Table 1 for an overview of central topics).

## **3. Synthesis**

A project team consisting of educationalists, media experts, evaluation experts, a marketer, and an overall project leader carried out the design, development, and implementation of the six micro modules. The educationalists were responsible for the content of the modules and acted as online teachers. Each micro module was directed by two educationalists as the subject matter experts. The overall project leader coordinated the design, development, and implementation of each module, and also the development of the multimedia productions that were part of the instructional content (i.e., expert interviews, animations, and infographics).

The design, development, and implementation was phased 'module-wise', meaning that the ISD processes for each module progressed sequentially in a pre-defined order (see Table 1). Design cycles for the modules were agile-like, and the evaluation results related to the implementation of the first micro modules were used as input in the design of subsequent modules (e.g., experiences with discussion forums, weblogs, and feedback in large groups led to the adoption, adaptation, or even suppression of certain forms of interaction in later modules; see also Hermans et al., 2014; Kop et al., 2011).

An important requirement for the design of the modules was that they had to promote active learning (Koper, 2014; Schlusmans et al., 2016). However, this requirement is at odds with the guidance of large groups of participants. As the number of participants was unexpectedly high, we had to redesign interaction and

feedback procedures at short notice (cf. Adnan & Ritzhaupt, 2018; Tripp & Bichelmeyer, 1990). Where redesign was inexpedient, it was decided to increase manpower.

The micro modules were presented to the participants in the course management system of the OUNL, named yOUlearn (Hermans et al., 2014; Vogten & Koper, 2018). A specific template for structuring the micro modules was developed, which steered the ISD processes and ensured that all modules had a similar and recognizable format.

#### 4. Evaluation

The evaluation of the micro modules focuses on (a) module participation and participants, (b) participants' perceived quality of the content, and (c) participants' suggestions for improvement.

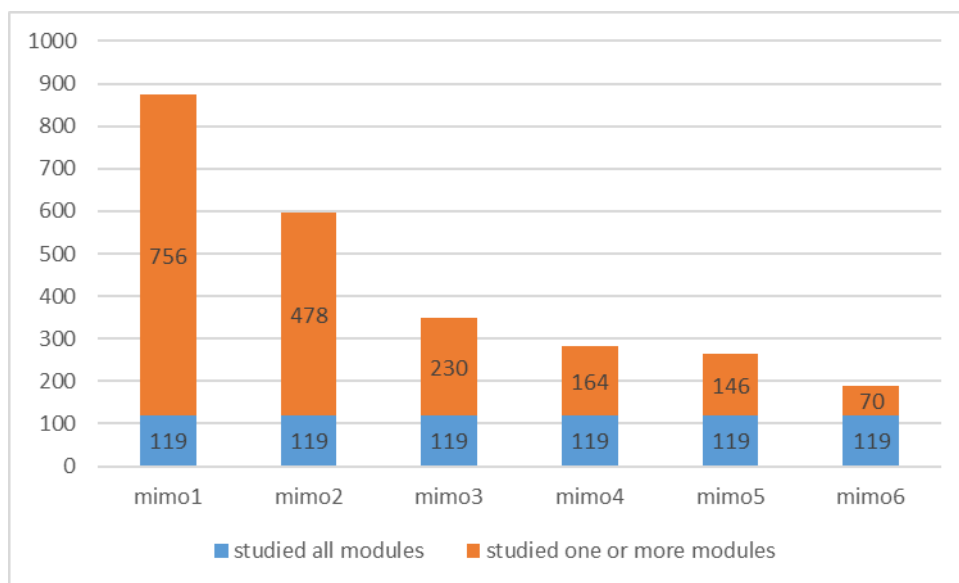


Figure 1. Number of participants per micro module (abbreviation: mimo; count: June 12, 2019).

The number of participants exceeded our expectations. Over 2400 educational experts initially indicated their willingness to attend the series of micro modules. In the end, 1191 professionals participated in one or more modules. Despite these numbers, the ISD project team maintained the principle that active learning should be central to the modules and that some form of interaction between participants, instructors, and content should be achieved. This meant that more teacher effort was needed than initially planned. Most of the participants were professionals in the educational field, of which approximately 24 percent (n=284) were current OUNL students. Participation decreased from 875 participants in the first micro module to 189 in the last. Figure 1 shows the decline of participants. This decreasing curve is a well-known fact in evaluation studies on success in open (and free) online education (Clow, 2013; Henderikx et al., 2017). Despite this decline, it is interesting to see that a cohort of 119 participants (appr. 10%) attended all micro modules (see Figure 1). The number of participants that followed only one module decreased as well. It seems that most participants were mainly interested in basic topics in online education. However, reasons such as participants' lack of time may also have influenced participation.

Participants that filled out the evaluation form were positive about the content of the modules. Ratings on a ten-point scale ranged on average from 6.9 to 7.9. Apart from the third micro module on virtual reality where some participants suffered technical problems, the median score was 8. Table 2 presents the data on content

quality as perceived by the participants. It should be noted that not all participants provided information regarding content quality.

Table 2: Participation and perceived quality.

Module	Participation		Perceived quality ratings		
	Overall	This module only	Mean	Median	Respondents
1	875	410	7.7 (1.08)	8	175
2	597	135	7.9 (0.96)	8	59
3	349	33	6.9 (1.65)	7	33
4	283	38	7.9 (1.93)	8	23
5	265	31	7.8 (1.09)	8	28
6	189	20	7.7 (1,22)	8	20

Note: Rating scale ranged from 0=poor to 10=excellent. Standard deviations between brackets.

We asked participants to share strengths and weaknesses related to the content, delivery, and teaching of the micro modules. Table 3 presents a summary of the participants' comments. These comments included 309 positive remarks (strengths) and 251 recommendations for improvements (weaknesses).

Table 3: Top 5 of strengths and weaknesses related to the micro modules (N=number of mentions).

	Strengths		Weaknesses	
	Topic	N	Topic	N
1	Relevant content	122	Technical and navigation problems	47
2	Structured overview of OE	65	Overwhelming group communication	38
3	Video transcripts and/or summaries	55	Content too superficial	24
4	Short and to the point	45	Videos too long (interviews)	20
5	Hands on experience	42	Insufficient variety	20

The participants valued the content and structure of the instruction. In addition to the instructional scope, the didactical approach of active learning (e.g., in hands on experiences) was appreciated. Despite the attention paid to the technical side of the modules, 'technique' turned out to be an Achilles heel for some of the participants. An interesting question related to 'technique' is how to address technical imperfections in participants' computer hardware and software AND participants' ICT skills. Although the participants valued the content, some of them mentioned a lack of depth in contemporary topics such as big data and learning analytics in online education settings (cf. Vogten & Koper, 2018).

## 5. Discussion

This paper presented an evaluation of a series of six short learning units on online learning, called micro modules. The focus was on a description of participation and user experiences (i.e., the participants' perceived quality of the instruction offered). Both participation and perceived quality were high, indicating that a specific need was properly met. However, this conclusion must be viewed with some caution. Especially the perceived high quality is based on the response from a portion of the total number of participants. Despite this, we think initial preferences regarding content, didactics, and instructional support can be identified based on this data. We also believe that the participants' desire to explore subjects in greater depth paves the way for a certified SLP. Such an SLP should aim at more 'hand-on experience' and focus on complex skill learning (Van Merriënboer & Kirschner, 2018; Wopereis, Frèrejean, & Brand-Gruwel, 2016) and competence development (Thaler & Bastiaens, 2017). More agile and lean approaches to ISD should be used as means to develop and implement such a short instructional program. Allen's (2017) Successive Approximation Model might be an interesting option for its design and development. An important element in this agile approach is co-creation

(Moerkerke, 2015). Although we already included the participants in our design process (e.g., the needs analysis), their contribution can be enhanced. We also think that the subject matter experts (SMEs, the teachers) should design more as a team, instead of focusing on their own field of expertise and developing a "part of the whole." A co-creating, holistic, and rapid approach to ISD is the key to successful and durable implementations of instruction on fast-changing topics like online learning. Modern distance universities must be able to facilitate this.

## 6. Acknowledgments

We would like to thank Diny Ebrecht, Willeke Kerstjens, Henk Munstermann, Gé Nielissen, Stefaan Ternier, Tamara van Driel, and Steven Verjans for their contribution to the realization of the micro modules. We thank Annemarie Cremers for proofreading the manuscript.

## 7. References

- Adnan, N. H., & Ritzhaupt, A. D. (2018). Software engineering design principles applied to instructional design: What can we learn from our sister discipline? *TechTrends*, *62*, 77-94. doi:10.1007/s11528-017-0238-5
- Allen, M. W. (2017). The Successive Approximation Model (SAM): A closer look. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (4th ed., pp. 42-51). Upper Saddle River, NJ: Pearson.
- Branch, R. M. (2009). *Instructional design: The ADDIE approach*. New York, NY: Springer.
- Clark, R. V., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Hoboken, NJ: Wiley.
- Clow, D. (2013, April). *MOOCs and the funnel of participation*. Paper presented at the International Conference on Learning Analytics and Knowledge, Leuven, Belgium.
- Deimann, M., Lipka, A., & Bastiaens, T. (2015). Strange bedfellows? What can MOOCs learn from distance education? In C. J. Bonk, M. M. Lee, T. C. Reeves, & T. H. Reynolds (Eds.), *MOOCs and open education around the world* (pp. 67-77). New York, NY: Routledge.
- European Association of Distance Teaching Universities (2016). *Memorandum of understanding between the European open and distance teaching universities on short learning programmes*. Maastricht, the Netherlands: Author. Retrieved from <https://eadtu.eu>
- Henderikx, M. A., Kreijns, K., & Kalz, M. (2017) Refining success and dropout in massive open online courses based on the intention–behavior gap. *Distance Education*, *38*, 353-368. doi:10.1080/01587919.2017.1369006
- Hermans, H., Kalz, M., & Koper, R. (2014). Toward a learner-centered system for adult learning. *Campus-Wide Information Systems*, *31*, 2-13. doi:10.1108/CWIS-07-2013-0029
- Kop, R., Fournier, H., & Mak, J. S. F. (2011). A pedagogy of abundance or a pedagogy to support human beings? Participant support on massive open online courses. *The International Review of Research in Open and Distributed Learning*, *12*(7), 74-93. doi:10.19173/irrodl.v12i7.1041
- Koper, R. (2014). Towards a more effective model for distance education. *eLeed*, *10*. Retrieved from <http://eleed.campussource.de/archive/10/4010>

- Magaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of massive open online courses (MOOCs). *Computers & Education, 80*, 77-83. doi:0.1016/j.compedu.2014.08.005
- Mayer, R. E. (2019). Thirty years of research on online learning. *Applied Cognitive Psychology, 33*, 152-159. doi:10.1002/acp.3482
- Moerkerke, G. (2015). Modern customers and open universities: Can open universities develop a course model in which students become the co-creators of value? *Open Learning: The Journal of Open, Distance and e-Learning, 30*, 235-251. doi:10.1080/02680513.2015.1117969
- Schlussmans, K., Van den Munckhof, R., & Nielissen, G. (2016). Active online education: A new educational approach at the Open Universiteit of the Netherlands. In G. Ubachs & L. Konings (Eds.), *Proceedings of the Online, Open and Flexible Higher Education Conference* (pp. 163-176). Maastricht, the Netherlands: European Association of Distance Teaching Universities.
- Thaler, I., & Bastiaens, T. (2017). *EADTU task force short learning programs: Final report*. Maastricht, the Netherlands: Maastricht, the Netherlands: European Association of Distance Teaching Universities. Retrieved from <https://eadtu.eu>
- Tripp, S. D., & Bichelmeyer, B. (1990). Rapid prototyping: An alternative instructional design strategy. *Educational Technology Research and Development, 38*(1), 31-44. doi:10.1007/BF02298246
- Van Merriënboer, J. J. G., & Kirschner, P. A. (2018). *Ten steps to complex learning: A systematic approach to four-component instructional design* (3rd ed.). New York, NY: Routledge.
- Vogten, H., & Koper, R. (2018). Towards big data in education: The case at the Open University of the Netherlands. In J. Spector et al. (Eds.), *Frontiers of cyberlearning: Emerging technologies for teaching and learning* (pp. 125-143). Singapore: Springer.
- Wopereis, I., Frèrejean, J., & Brand-Gruwel, S. (2016). Teacher perspectives on whole-task information literacy instruction. *Communications in Computer and Information Science, 676*, 678-687. doi:10.1007/978-3-319-52162-6\_66

## Towards a taxonomy of digital skills and competencies of university teachers – a guide for institutional accreditation practices

**Marianne Helfenberger**

Swiss University of Distance Learning, Switzerland

[marianne.helfenberger@fernuni.ch](mailto:marianne.helfenberger@fernuni.ch)

### Abstract

This paper departs from the question on how to identify and develop university teachers' digital skills and competencies to provide university institutions with instruments that value and/or attest their academic teachers' digital, pedagogic, and "digital-pedagogic" output. Our first step was to review a) empirical research literature, b) university offers and practices in (digital and pedagogical) skills and competence development, and c) institutional and theoretic models of competence frameworks both for university teachers in general and for specific settings of distance teaching and learning. From this repertoire of empirical, theoretic and practical knowledge, we chose, mixed and modified models and reference frameworks to create our own proposal to suit institutional aims to certify and value their academic staffs' educational work. Firstly, we designed a flexible and dynamic reference framework for academic teaching competencies within a dual model of the academic profession in general. We gave special consideration to digital skills and competencies placing them in a taxonomy drawing on Bloom and Krathwohl. Secondly, we conceived a relational database to visualize different constellations of the skills and competencies from different perspectives: evaluation actors, digital tool-relations, student course temporality, taxonomy levels, formative opportunities for teachers and attesting options. Lastly, we argue that institutional certification of professional and digital skills and competencies must rely on an institutional framework of formative offers and opportunities to develop digital competence that allows also for alternative forms of evaluation.

**Keywords:** university teachers, digital competences, accreditation.

### 1. Introduction

"Effective digital transformation isn't just about technology, though. It requires a willingness to adopt technology in new ways, beyond administrative process. It must be continual and evolutionary in order to enhance teaching and learning, support business processes and improve efficiency. It also necessitates collaborative working; vision and leadership; culture; process and methodology – and the technology itself." (Patton, 2018) This quote stems from an article entitled "Digital evolution: a new approach to learning and teaching in higher education" and stands paradigmatically for worldwide discourses about the relationship between new technologies and education. What makes it particularly interesting for our case is that the demands explicitly address higher education.

After reviewing a vast and representative research literature, theoretical models and international or national digitalization policies, we decided to construct an own competence framework which is still in process of empirical validation. All theoretical frameworks have their own advantages and pitfalls. Despite empirical validity and reliability, they are not absolutely "objective" and most important, they are not universal but historically contingent. Thus, we will also expose and discuss the assumptions and contextual situation that gave rise to our model. *Swiss University of Distance Learning* offers the same kind of academic bachelor and master study programs oriented towards basic research as "presence universities". Specific though is the fact

that all courses at *Swiss University of Distance Learning* are exclusively blended and hybrid, while "presence universities" structure their courses on a weekly presence base. This does not mean though, that "presence universities" do not engage in digitalization of teaching and learning and blended courses. Rather than an absolute "either/other" question of presence versus blended studies, it is a question of degree. In addition, amount and variety of digital tools does not depend only on university's structure, but also on disciplinary and pedagogic requirements. Even the main difference between both types of university, the body of students, is not to be taken in absolute terms: Most students at *Swiss University of Distance Learning* are between thirty and fifty years old, are in the middle of working and / or family life and thus more experienced than the majority of students at "presence universities". But even young students who enter university directly after high-school graduation are not necessarily full-time students anymore. The major part of teaching staff at *Swiss University of Distance Learning* is not employed on a full-time base being responsible for research and teaching. They are recruited from other Swiss (presence) universities where their research is situated and are committed to teach one or two modules each semester. Assuming that they do not necessarily have experience in the specificities of distance studies, they receive technical and pedagogical introduction to the principles of blended studies as well as an institutional introduction explaining the characteristics of its public. In this context, teaching staff at *Swiss University of Distance Learning* learn to

- implement virtual classes with tools like adobe connect and educational videos,
- visualize the structure of a module in so called pedagogical scenarios and fill fact sheets containing all important information about content, learning outcomes, etc. (figures 1 and 2), and
- navigate within the institution's platform (moodle) and the administration system (erp).

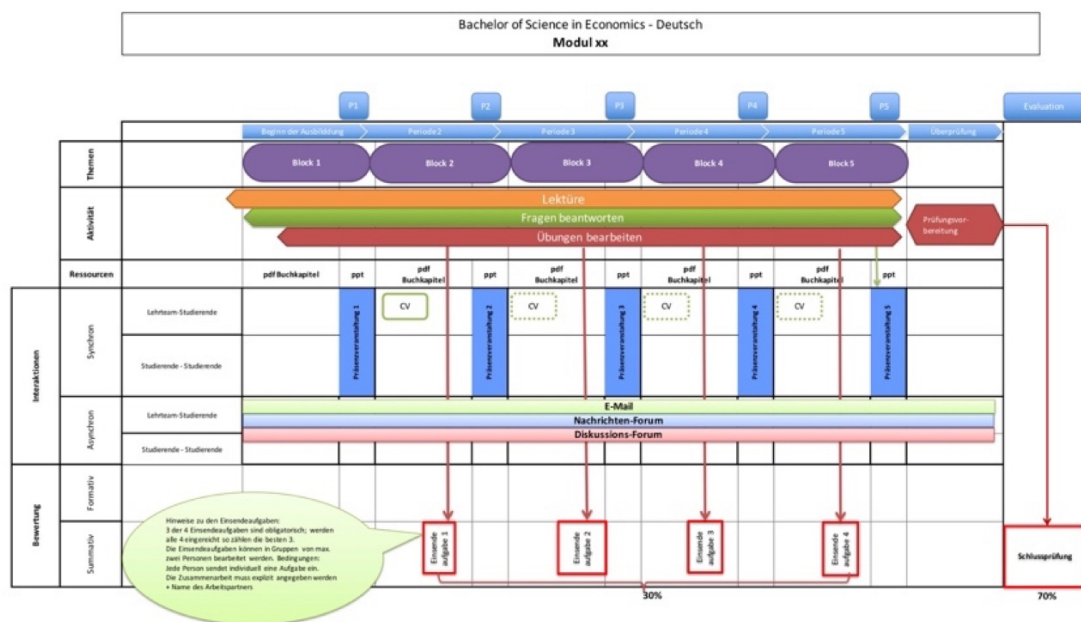


Figure 1: Example of a pedagogical scenario.





Factsheet	
Modulname	
Semester angeben	

Factsheet: Modulnummer Modulname

Modulname			
Modulnummer			
Zuordnung zum Studiengang/ zu den Studiengängen			
Studienstufe	Bachelor <input type="checkbox"/>	Master <input type="checkbox"/>	
Modultyp	Pflichtmodul <input type="checkbox"/>	Wahlpflichtmodul <input type="checkbox"/>	Wahlmodul <input type="checkbox"/>
Lehrteam/ Modulverantwortliche**	Dozierende: Email: Assistierende: Email:		
Durchführung des Moduls	HS <input type="checkbox"/>	FS <input type="checkbox"/>	HS/FS <input type="checkbox"/>
Moduldauer	1 Semester		
Unterrichtssprache	Sprache angeben		

Version 08/17

1

ECTS	Anzahl ECTS angeben		
Modulniveau	Einführung <input type="checkbox"/>	Vertiefung <input type="checkbox"/>	Spezialisierung <input type="checkbox"/>
Themen und zentrale Konzepte/ Inhalte			
Vorkenntnisse/ Eingangsvoraussetzungen	<ul style="list-style-type: none"> <li>Module:</li> <li>Sonstige Vorkenntnisse / Eingangsvoraussetzungen</li> </ul>		
Learning Outcomes/ Kompetenzen*	Nach Abschluss dieses Moduls ... <ul style="list-style-type: none"> <li>Learning Outcome 1</li> <li>Learning Outcome 2</li> <li>Learning Outcome 3</li> <li>.....</li> </ul>		
Lehrmittel	<b>Pflichtliteratur</b> <ul style="list-style-type: none"> <li>Ref</li> <li>Ref</li> </ul> <b>Zusatliteratur / weiterführende Literatur</b> <ul style="list-style-type: none"> <li>Ref</li> </ul>		

Version 08/17

	• Ref							
Leistungsnachweise	Gewichtung	Form			Modalität			
		schriftlich	mündlich	multi-medial	Einzel	Gruppe	Präsenz	Distanz
Leistungsnachweis 1	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leistungsnachweis 2	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leistungsnachweis 3	%	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
...								
Workload - Studierende (h)	Interaktionen Studierende - Lehrteam							
	Präsenzveranstaltungen							
	Visio Konferenzen und virtuelle Klassen							
	Lesen und Schreiben von E-Mails, Lesen und Schreiben in Foren, Wiki...							
Individuelle Arbeit Studierende								

Lesen und Hinzuziehen von Ressourcen, welche vom Lehrteam zur Verfügung gestellt wurden.	
Individuelle Recherchen und Erstellen von persönlichen Dokumenten	
Übungsfragen und formative Evaluationen	
Gruppenaktivitäten der Studierenden	
Virtuelle Klassen, Visio Konferenzen mit anderen Studierenden	
Gruppenarbeiten	
<b>Summative Evaluation des Moduls</b>	
Summative Zwischenevaluationen (inkl. der Vorbereitungszeit)	
Summative Schlussevaluationen (inkl. der Vorbereitungszeit)	
<b>Total Workload Studierende (h)</b>	

\* orientiert an den im Qualifikationsrahmen (nfg.ch-HS) definierten Deskriptoren  
 \*\* bezeichnet die/den Modulverantwortliche(n)

Figure 2: Example of a factsheet.

To secure continuous development, *Swiss University of Distance Learning* offers workshops and a yearly event dedicated to digital-pedagogical issues. It is within this context that the conditions to develop, recognize and attest digital-pedagogical competencies aroused the institution's interest. Thus, our digital skills framework and our proposal for institutional attesting practices of academic staff's digital-pedagogic output has specific characteristics for its situated context in a) distance studies, b) students' intersectional lifestyles, c) teaching staff's poly-institutional engagement, and d) Swiss education landscape. Nevertheless, we believe that it can inspire adaptations for other settings and contexts. To expose the possibilities for attesting digital-pedagogical output from academia, we will first discuss the context that informed our competence framework and taxonomy of digital competence, that is, distance studies. Then we will expose framework and taxonomy themselves. Third, we will discuss potential practical usages of our framework and the data base that contains it. Finally, we make some concluding remarks regarding institutional attesting practices.

## 2. Didactical triangle, pedagogical discourses and educational innovation

"That this life [...] will be evident firstly, from the *witness of our own selves*, secondly from the *world*, and, thirdly from the *Holy Scriptures*". (Comenius, 1657/1907, p. 32) The relationship between teacher, learner and content constitute the pedagogical relationship par excellence; it is a relationship between oneself, the world and knowledge. This knowledge is historically contingent and valued by a specific society in a specific time in history. Also, knowledge is always mediated by modern or old technologies, regardless of the cultural priorities of a given society. If, for pre-enlightenment society, knowledge was defined by religion transmitted by the Holy Scriptures, whether written or orally, modern societies opted for more diversified choices of what they consider to be relevant knowledge. Johann Friedrich Herbart (1776-1841) defined the relationship between

content, the self and the world as the core object of applied pedagogical science (Herbart, 1806) leading since then to the development of all sorts of more or less sophisticated and modernized variations and also critique of what is now known as didactical triangle. (Bönsch, 2006; Goodchild & Sriraman, 2012; Gruschka, 2011; Rezat & Sträßer, 2012; Schoenfeld, 2012)

The didactical triangle represents an extraordinary instrument for modern pedagogical critique due to its inherent dualisms between teaching and learning on one side and between knowing and understanding on the other. Dualisms permit to polarize educational criticism. Thus, characteristic to modern education and schooling since the onset of modernity is to question teaching authority and to transform teachers into a kind of pedagogical companion and coach along with opposing memorization to understanding. These dichotomies are implicitly normative and serve to legitimize implementations of educational and institutional policies. (Oelkers, 1996, 1997; Zymek, 1998)

Today, this criticism, initially addressed to primary schools, has climbed up the ladder of the education system up to university level. The Bologna reform triggered public and academic debates on and demands for competence frameworks. (Arnold, 2015; Claus, 2013; Eckardt, 2005; Gaston, 2010; Hafenegger, 2013; Reinalda, 2006; Zinger, 2012) Distance education models are not excluded from the resulting expectations towards teachers and students: „The goal is not the transfer of information but to guide learners in their pursuit of knowledge. Further, much of the responsibility for learning is given to the learner with the instructor acting as a coach, facilitator, and tutor.“ (Darabi, Sikorski, & Harvey, 2006, p. SEARCH)

Distance education is mostly identified with digital technology and virtual classes, even though distance learning has a long history dating back to the early 20<sup>th</sup> century and technological demands were less differentiated. The original idea of democratizing access to education at different levels of the educational system and of improving the social condition of society's less privileged sectors (Schulte, 2011) coexists today with other goals that target primarily individual needs. Institutions offering distance studies react to such needs and adapt their offer to the socio-economic context in which they are situated. The basic premise remains unchanged: teaching and learning take place physically separated. (Keegan, 2002, p. 20) This premise may be based on various theoretical preconceptions that reveal different understandings of the meaning of "distance learning" by taking a purely geographic, pedagogical, psychological or apparently historical perspective. Accordingly, discourses emphasize transfer of materials and information by different media, pedagogical actors and their roles as teacher and learner, students' autonomy and freedom, and finally rhetorical dualisms of tradition and innovation, convention and modernity. (Schulte, 2011) A terminological variety mirrors these perspectives addressing distance educational offers as distance *training*, *studying*, *learning*, or even as *e-learning*.

Adopting the typical language of pedagogical critique, comparisons between distance and "presence universities" tend to construct them as dichotomous. Focusing the geographical dimension serves to polarize these two types of educational institutions. Thus, discursively, differences between the two are emphasized and their parallels neglected. The fact that "presence universities" are historically older than distance universities, permits to define them as "traditional" as opposed to "new" or "modern" suggesting not only a difference in time, but also in quality in a normative sense. This way, face-to-face courses can be labeled "instructivist" and teacher centered focusing on "passive" knowledge distribution and accumulation. And university lectures in "presence universities" become identified exclusively with teaching *ex cathedra*, regardless of an also traditional formal and methodical diversity which is not limited to a professor reading a lecture in front of a mass of students. Critique of this one form of university lectures states that distance studies

oblige per se innovation, constructivist learning and student centered approaches transforming teachers into learning coordinators and coaches. (Darabi et al., 2006; Schulte, 2011) However, a distinction between "passive" and "active" learning is not meaningful because all learning is active learning and knowledge construction. No one could seriously affirm that all historical efforts to teach and learn were up to now ineffective and that individuals and humanity have not learned because of "passive" learning behavior. The same can be stated regarding old and new teaching and learning technologies.

The phenomenon of digitalization suffices as argument to legitimize educational programs and promises of change and evolution. Contrasting historical and new media with the language of pedagogical critique tends to be normative by connoting historical media with backwardness and new media with progressivism. Scholars engage in this discourse and demand pedagogic innovation to promote access to information, to transform and produce differentiated knowledge by incorporating technology. In doing so, they construct an alliance between information technologies and pedagogical theories claiming that they demand to reform interactions between teachers and learners through decentralized learning. Such learning settings would require projecting teachers' presence into the distant setting to develop learning communities online and group cohesion. In this logic, it is assumed that this setting obliges to learn autonomously and to conceive online learning programs for knowledge construction. (Burkle & Cobo, 2018; García et al., 2018; Guri-Rosenblit, 2018; van der Rijst, Baggen, & Sjoer, 2018) It seems paradox that this emphasis on autonomy results in demanding more management and learning monitoring from teachers who are appealed to intervene more directly into learning guidance and feedback, and to stimulate motivation, positive emotions and self-regulatory and metacognitive processes. However, research comparing face to face and distant learning has not empirically proved any supremacy of e-learning because of its technological advantage and its suitability for autonomous learning. The variety between and within disciplines, courses and individuals is too great to make valid comparisons and to make sustainable conclusions. (Schulte, 2011) At the same time as pedagogical programs support the advantage of autonomous learning, some research shows that most students "are unable and/or unwilling to study by themselves without expert teachers to guide their knowledge construction." (Guri-Rosenblit, 2018 abstract) Others conclude that the quality of learning increases when the student is "present" with the participation of the teacher. (García et al., 2018) Also, the discourse is characterized by the effort to compensate certain losses by transitioning from face-to-face to distant. Studies also show that there is not a significant difference in the quality of teaching and learning. (Russell, 1999; Schulte, 2011)

Promoters of online education and tools argue in their favor in the name of student autonomy. However, autonomy represents only one side of the coin. Efforts for digitally supported distance learning are accompanied by intensive efforts to control a range of complex interactions. Collaboration between teacher and learner must be additionally coordinated in reaction to a situation that is perceived as deficit and that needs to be compensated. In summary, it is about establishing a remote teaching presence at different levels: emotional, discursive, experiential and while learning. Emotional presence is considered necessary to ensure controlled interactions; discursive presence is supposed to include listening, reading, writing and debate; distant student interaction and technological diversity shall promote action, practice, analysis and knowledge construction; and teachers' presence becomes simulated by management, monitoring, feedback, stimulation of motivation and group cohesion. (García et al., 2018) On one side empirical research tries to determine distance's and face-to-face education efficacy and, if they are not equivalent, to find ways to compensate deficits. This approach though, also means meticulous design to align learning experience with students' individual dispositions and contexts and with the courses' contents. In conclusion, all these approaches support the importance of the role of the teacher and the experts for designing meaningful learning experiences and

thus relativize the weight of students' autonomy. It is thus not surprising that university teachers' digital competence is now at the core of professional development discourses.

Research literature and theoretical models draw on proposals for lower educational levels to conceptualize alternatives for university teachers. Digital competence models have mostly two or four competence domains, a certain number of generic competences and their empirically validated indicators.<sup>1</sup> However, when focus and mastery of resources and knowledge are oriented exclusively to technological skills instead of including all professional domains common to teaching, they risk losing pedagogical relevance. Developing digital competence has to interplay with transmitting the relevance of scientific and cultural knowledge, knowledge selection and organization for teaching and learning, motivating students and furthering learning, curricular development, connecting course content with social reality, improving students' (self-)reflexive observation, peer-collaboration to academically and professionally guide students, etc. (Cabero Almenara & Marín Díaz, 2012; Tejada Fernández & Ruiz Bueno, 2015) Thus, the attributes "online" or "digital" could be eliminated from educational processes of planning, conducting and evaluating learning processes and teaching impact without prejudice to the pedagogical competence of a teacher at any level of the school system, because the format of pedagogical media becomes secondary. We will exemplify the ambiguous relationship between competence and specific media with the case of curriculum development as teachers' competence. University curriculum is defined by social demands, national and international educational policies and disciplinary developments. Therefore, it is not an empirically measurable individual competence, but must be evaluated qualitatively. Digital skills and competences constitute only a part of this competence. Another example is students' evaluation of their teachers teaching ability which can only represent the students' biased appreciation, but not the ability itself.

### **3. On competence and frameworks**

We understand "competence" as multidimensional: it includes an observable behavior, performance and combination of knowledge, abilities and personal attributes. (Darabi et al., 2006) It can be said that "competence" is a set of different knowledge fields: content knowledge and procedural knowledge that integrates attitudes and coordinates action and being within a professional field. Thus, competence is not a static characteristic. On the contrary, it is defined in action and experience is an indispensable part, because competence mobilizes resources (knowledge) to solve specific problems in situations and concrete contexts. Competence masters action giving the ability to act and react in a relevant and sustainable way in all situations. (Tejada Fernández & Ruiz Bueno, 2015) These competency definitions are derived from empirically validated indicators. At the same time, in the same discourse of performance, literature supports that it is not possible to evaluate skills, but only what is understood as skill. So, despite empiricism, concepts, operationalization and evaluation, the concept of competence is not neutral. (Le Boterf, 2006)

Institutional evaluation practice does not have direct access to measure teachers' skills and competencies. It would be neither neutral nor achievable to observe educational performance in action. The most common method is teachers' evaluation by students. Obviously, this form of evaluation has limits due to divergent interests and premises informed by their role as students and their heterogeneous contexts and dispositions. In addition, student evaluations should be triangulated with exam results or other indicators of student performance if they should be meaningful. (Schulte, 2011) This involves conflicts with the demand for data protection and is thus not an alternative for a comprehensive view of teachers' competencies.

---

<sup>1</sup> See for example research on validated (digital) competencies by (Darabi et al., 2006; García et al., 2018; Moreno-Murcia, Silveira Torregrosa, & Belando Pedreño, 2015).

Educational institutions face societal demands that shape and define expectations about competence, and pressure to develop them. Thus, educational institutions need to make curricular decisions between their own practices and national or international policies. Constructing competence models and instruments to attest competences represents a methodological balancing act. While developing curricula based on local contexts and disciplinary prescriptions is an inductive procedure from which to derive competencies, fitting them to theoretical models that respond educational policy is deductive and potentially normative. This puts into question empirical validity and reliability of any theoretical competence framework. However, this does not diminish their societal relevance. Societies select and prioritize knowledge defining historically contingent knowledge systems, and with them they define norms to establish them through education. (Durkheim, 1972)

It is consensual among educationalists that technology for its own sake is not at the core of digital competencies in education, especially for teachers and university professors. (see Durán Cuartero, Gutiérrez Porlán, & Prendes Espinosa, 2016) In other words, using technology in education is to be *pedagogically* meaningful. This is the case when technology serves developing education in multiple ways reinforcing all levels of professional action fields in educational institutions. We offer one more model in the landscape because every institutional context is unique and faces specific needs that cannot be met with standardized models even though they can be a meaningful source of inspiration. Our first step to develop a digital competence framework for university teachers was to review a) empirical research literature, b) university offers and practices in (digital and pedagogical) skills and competence development, and c) institutional and theoretic models of competence frameworks both for university teachers in general and for specific settings of distance teaching and learning. From this repertoire of empirical, theoretic and practical knowledge, we chose, mixed and modified models and reference frameworks to create our own proposal to suit institutional aims to certify and value their academic staffs' educational work.

The fact that teaching staff at *Swiss Distance University* is mostly employed on teaching assignment for one or two modules within a study program informed our concept of university teachers' professionalism: They are not committed to only one academic institution, they might as well work for other research institutions or professional fields. Thus, we had to develop a framework that values and encompasses as much professional activity as possible that can be beneficial for student and institutional development. Usually, competence frameworks envision three areas within institutional settings: research, teaching and administration. This model intends to differentiate between institutional and extra-institutional settings in which university teachers act as professionals as well as between actual teaching and learning and other activities and attitudes towards students, education, university institutions and academic communities. So, the model's 'six + one' competence areas are

1. *Teaching and learning* including all competencies related to pedagogical conceptualization of the course, its realization and finalization,
2. *Evaluation* including all competencies directed to evaluate students' learning achievements but also analyzing and reacting to students' teacher evaluation,
3. *Empowerment* is directed to students' disciplinary and personal autonomy to further their professionalism,
4. Participating in an (broader) *academic community* as a digital-pedagogical competence area means commitment to sharing and debating pedagogical issues with peers to add value to academic pedagogic work,
5. *Professional commitment* addresses all competencies to autonomous personal professional development by attending courses, personal study, etc. aiming at informing educational processes,

6. *Institutional commitment* relates to all competencies used for institutional adjustment, faculty and curricular development, administration and communication within the institution,
  - *Digital competence* is understood as transversal competence across the other six competence areas and includes using, selecting, producing and sharing digital resources.

Defining taxonomies could be possible for all competence areas. We limit it, though, to the area of digital competence. Instead of proposing a cognitive taxonomy from understanding, applying, analyzing, synthesizing and evaluating (Bloom, Krathwohl, & Masia, 1965) to educational goals towards the *usage* of ICT, we decided to focus on creative and innovative *production* of digital material and tools. This perspective does not exclude the first one. We consider though, that university teachers have the highest possible educational level within education systems. Thus, more than minimal technological skills even at different taxonomy levels should be taken for granted or delegated to their personal professional responsibility; and, in their discipline and other life fields, they already reached higher levels of taxonomy. However, a taxonomy can be applied to teachers' contribution to innovate and develop digital spaces. Evidently, this requires knowledge in computer engineering and computer sciences. This cannot be expected from scholars throughout all disciplines. Developing university teachers' skills in informatics is much more attractive and rewarding both for them as for institutions because digital solutions for pedagogical and / or disciplinary challenges cannot rely solely on computer engineers or on products developed for other purposes than research and education. Therefore, we propose a taxonomy inspired by Bloom et al., but applied to processes of innovating in education, of developing digital-pedagogical material and of diffusing these products (see figure 3).

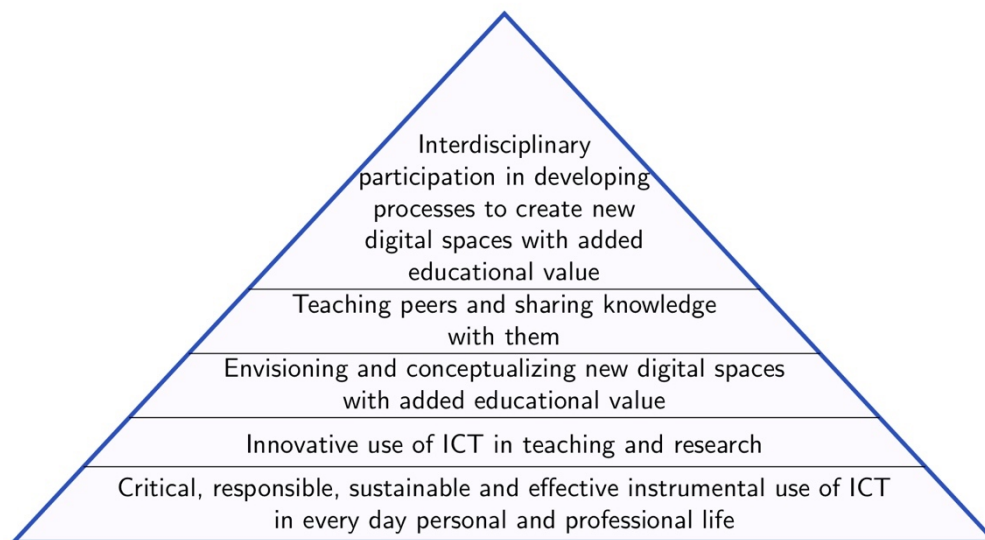


Figure 3: Taxonomy of digital competences.

#### 4. Relational database as competence identifier tool – taxonomy and beyond

Based on the exposed understanding of competence and the definition of six domains of professional competence within which digital and non-digital generic competencies with their correspondent indicators are situated, we conceived a relational, dynamic and flexible database to visualize different constellations of skills and competencies from different perspectives: evaluation actors, digital tool-relations, student course temporality, taxonomy levels, formative opportunities for teachers and attesting options. The database is already functional; an ergonomic and user-friendly html-application is still under construction so it can be tested. Our data base has different utilities: it can serve



- teachers to position themselves as actors within a broader understood concept of professionalism aiming at autonomous self-development,
- university institutions to develop their pedagogical engineering offers and with it to attest competencies, and also to adapt student evaluation forms,
- educational professionals to debate theoretical issues and practical implementation of reference frameworks.

Relations between data are both hierarchical and horizontal, unique and multiple. Each of the six main areas of professional competence encompasses several competences and each competence several indicators. Competences and indicators from the digital competence area also refer to one of the main areas of professional competence (see figure 4). Thus, digital skills and competences are never isolated. Other indicators can be manifested in using one or more digital tools at the same time as one digital tool may further one or more competence indicators (see figure 5). One competence indicator can be

- evaluated by more than one type of evaluator,
- developed by using different digital tools or attending different training offers,
- attributed to a taxonomy of digital competence,
- relevant in a long-term professional development or within an established time period such as the realization of a course from its planning to the end.

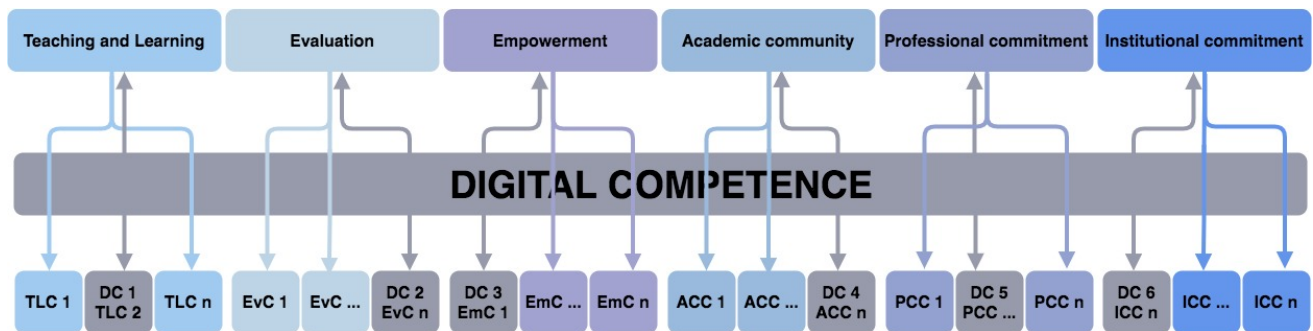


Figure 4: Competence framework schema. First line: competence areas; second line: digital competence; third line: competencies represented by colors and acronyms corresponding to the competence areas from the first line. Arrows indicate the relation between competencies and competence areas and show the overlapping relation between the main competence areas and the digital competence area.

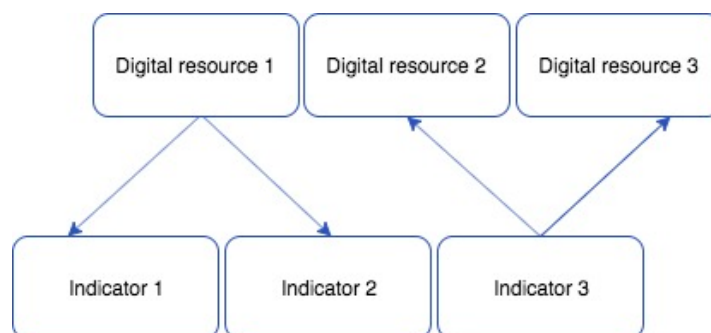


Figure 5: Multiple relations between indicators and digital resources.

The data base includes more than 150 indicators of digital and other competencies. This amount is justified by the data base's multiple utilities, relationships and views. Institutions should be able to remove, add and



prioritize indicators and teachers' competencies they wish to promote, develop and attest. Figure 6 represents the framework data base structure.

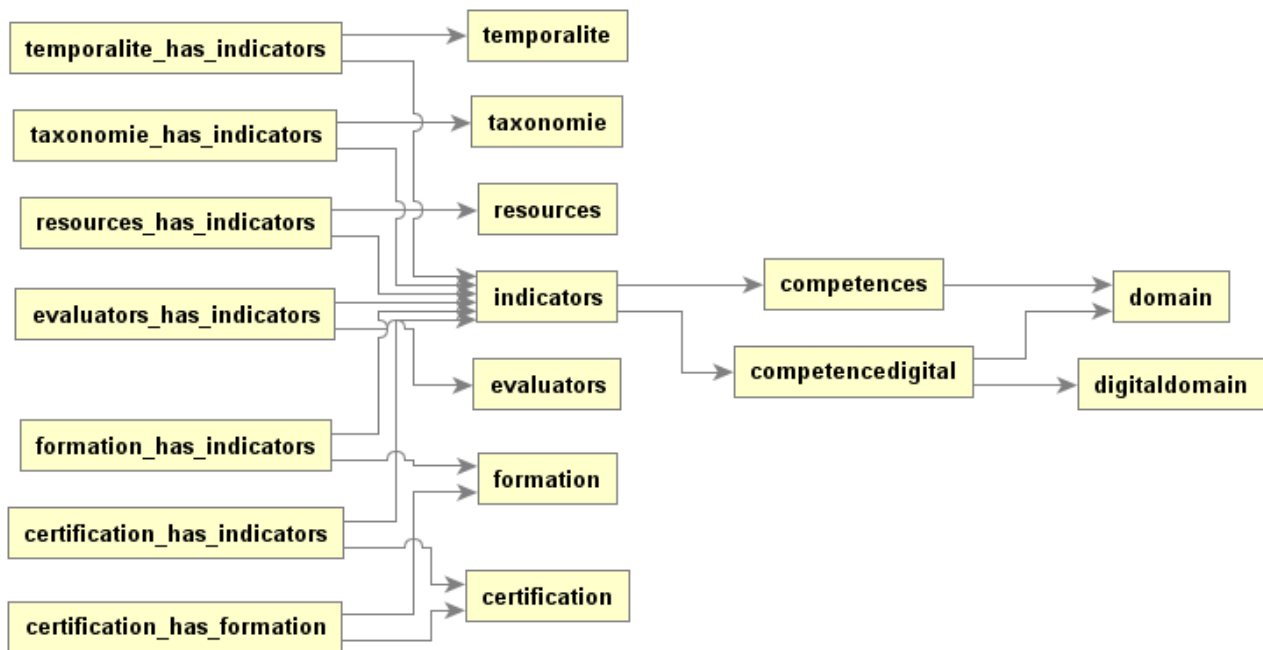


Figure 6: Data base structure.

## 5. Conclusions

University teachers in general are active in one or more academic institutions, national and international professional networks, and eventually in NGO's or community work that rely on their professional expertise. All these fields of professional activity offer formal and informal opportunities for (digital) competence development. Institutions that want to attest or certificate university teachers' digital skills and competences have to take account of these multiple academic relationships. Our framework offers a possible model to address the challenge. But most relevant seems to be that frameworks fit institutional contexts and conditions rather than institutions trying to adapt their context to abstract political and societal demands. Thus, we argue that institutional attesting and certifying practices must rely on institutional offers and opportunities to develop digital competence that integrate alternatively and informally acquired knowledge without intending to certificate what had been acquired elsewhere. For this purpose, institutions need to develop incentives that motivate teachers to link their informal activities and their elsewhere acquired competencies with their institutional activity and their peers' needs. Instead of thinking of them as lacking enough digital competence and concentrating on technical skills or implementing specific tools and media, institutions should focus on their teaching staff's digital experience in research and other fields. Valuing digital-educational work and academic freedom rather than digital skills for their own sake is indispensable if attesting and certifying has to meet academic teachers' interests and needs. Offering them opportunities to bring in and develop their digital-educational expertise, to share it with peers and motivate these, to cooperate with educational engineers in the process of developing and profiling institutional formal and informal offers seems more adequate to university level than top-down approaches that rely on global policies and competence frameworks which restrain academic freedom.

## 6. References

Arnold, R. (2015). *Bildung nach Bologna! : die Anregungen der europäischen Hochschulreform*. Wiesbaden:

Springer VS.

- Bloom, B. S., Krathwohl, D. R., & Masia, B. B. (Eds.). (1965). *Taxonomy of educational objectives: the classification of educational goals*. New York: Longman.
- Bönsch, M. (2006). Das didaktische Dreieck als Grundmodell. In M. Bönsch (Ed.), *Allgemeine Didaktik* (pp. 149–169). Stuttgart: Kohlhammer.
- Cabero Almenara, J., & Marín Díaz, V. (2012). ICT training of university teachers in a Personal Learning Environment. Project DIPRO 2.0. *NEW APPROACHES IN EDUCATIONAL RESEARCH*, 1(1), 2–6. <https://doi.org/10.7821/naer.1.1.2-6>
- Claus, S. (Ed.). (2013). *Studium und Lehre nach Bologna: Perspektiven der Qualitätsentwicklung*. Wiesbaden: Springer VS.
- Comenius, J. A. (1907). *The Great Didactic of John Amos Comenius*. (M. W. Keatinge, Ed.). London: Black.
- Darabi, A. A., Sikorski, E. G., & Harvey, R. B. (2006). Validated Competencies for Distance Teaching. *Distance Education*, 27(1), 105–122. <https://doi.org/10.1080/01587910600654809>
- Durán Cuartero, M., Gutiérrez Porlán, I., & Prendes Espinosa, M. P. (2016). Análisis conceptual de modelos de competencia digital del profesorado universitario. *Revista Latinoamericana de Tecnología Educativa*, 15(97–114), 1–16. <https://doi.org/10.17398/1695>
- Durkheim, É. (1972). *Erziehung und Soziologie*. Düsseldorf: Pädagogischer Verlag Schwann.
- Eckardt, P. (2005). *Der Bologna-Prozess: Entstehung, Strukturen und Ziele der europäischen Hochschulreformpolitik* (Orig.-Ausg.). Norderstedt: Books on Demand GmbH.
- García, B., Serrano, E. L., Ponce Ceballos, S., Cisneros-Cohernour, E. J., Cordero Arroyo, G., & Espinosa Díaz, Y. (2018). Las competencias docentes en entornos virtuales: un modelo para su evaluación. *RIED. Revista Iberoamericana de Educación a Distancia*, 21(1), 343–365.
- Gaston, P. L. (2010). *The challenge of Bologna: what United States higher education has to learn from Europe, and why it matters that we learn it*. Sterling, Va.: Stylus.
- Goodchild, S., & Sriraman, B. (2012). Revisiting the didactic triangle: from the particular to the general. *ZDM*, 44(5), 581–585. <https://doi.org/10.1007/s11858-012-0449-3>
- Gruschka, A. (2011). Das didaktische Dreieck - eine theoretische Reformulierung. In A. Gruschka (Ed.), *Didaktik: das Kreuz mit der Vermittlung. Elf Einsprüche gegen den didaktischen Betrieb* (pp. 87–134). Wetzlar: Büchse der Pandora.
- Guri-Rosenblit, S. (2018). E-Teaching in Higher Education: An Essential Prerequisite for E-Learning. *Journal of New Approaches in Educational Research*, 7(2), 93–97.
- Hafener, B. (2013). „Bologna-Reform“. *Sozial Extra*, 37(7), 20–22. <https://doi.org/10.1007/s12054-013-1027-9>
- Herbart, J. F. (1806). *Allgemeine Pädagogik: aus dem Zweck der Erziehung abgeleitet*. (J. F. Röwer, Ed.). Göttingen: Johann Friedrich Röwer.
- Keegan, D. (2002). *The future of learning: from eLearning to mLearning*. Hagen: Zentrales Institut für Fernstudienforschung.
- Le Boterf, G. (2006). *Ingénierie et évaluation des compétences* (5e éd). Paris: Ed. d'organisation.

- Moreno-Murcia, J. A., Silveira Torregrosa, Y., & Belando Pedreño, N. (2015). Questionnaire evaluating teaching competencies in the university environment. *Evaluation of teaching competencies in the university. NEW APPROACHES IN EDUCATIONAL RESEARCH*, 4(1), 54–61. <https://doi.org/10.7821/naer.2015.1.106>
- Oelkers, J. (1996). *Schultheorie und Schulkritik : Vorlesung im Wintersemester 1995/96, Universität Bern*. Bern: Institut für Pädagogik. Abteilung allgemeine Pädagogik.
- Oelkers, J. (1997). Is There a "Language of Education"? *Studies in Philosophy and Education*, 16(1), 125–138. <https://doi.org/10.1023/A:1004903105709>
- Patton, R. (2018). Digital evolution: a new approach to learning and teaching in higher education. *The World University Rankings*, s.p. Retrieved from <https://www.timeshighereducation.com/blog/digital-evolution-new-approach-learning-and-teaching-higher-education>
- Reinalda, B. (2006). *The Bologna Process : harmonizing Europe's higher education : including the essential original texts*. (E. Kulesza, Ed.) (2nd rev ed). Opladen: Budrich.
- Rezat, S., & Sträßer, R. (2012). From the didactical triangle to the socio-didactical tetrahedron: artifacts as fundamental constituents of the didactical situation. *ZDM*, 44(5), 641–651. <https://doi.org/10.1007/s11858-012-0448-4>
- Russell, T. L. (1999). *The no significant difference phenomenon as reported in 355 research reports, summaries and papers: A comparative research annotated bibliography on technology for distance education*. Chapel Hill, NC: Office of Instructional Telecommunications, North Carolina State University.
- Schoenfeld, A. (2012). Problematizing the didactic triangle. *ZDM*, 44. <https://doi.org/10.1007/s11858-012-0395-0>
- Schulte, M. (2011). The Foundations of Technology Distance Education: A Review of the Literature to 2001. *The Journal of Continuing Higher Education*, 59(1), 34–44. <https://doi.org/10.1080/07377363.2011.544981>
- Tejada Fernández, J., & Ruiz Bueno, C. (2015). Evaluación de competencias profesionales en educación superior: retos e implicaciones. *Educación XX1*, 19(1), 17–38. <https://doi.org/10.5944/educxx1.12175>
- Zinger, B. (2012). *Das Hochschulstudium nach Bologna : zwischen Strukturreform und didaktischer Neuausrichtung* (Biografie - Interaktion - Gesellschaft). Kassel University Press, Kassel.
- Zymek, B. (1998). Die Schule als kulturkritisches Konstrukt und ihre Kontrastfolien. Kritische Anmerkungen zur Schulkritik der Reformpädagogik. In T. Rülcker & J. Oelkers (Eds.), *Politische Reformpädagogik* (pp. 185–200). Bern etc.: Peter Lang.

## Tutors' perceptions of blended and online higher education: the case of Hellenic Open University

**Rozalia Kalantzi**

Hellenic Open University, Greece  
rkalantzi@eap.gr

**Theofanis Orphanoudakis**

Hellenic Open University, Greece  
fanis@eap.gr

### **Abstract**

Hellenic Open University (HOU) is the only university in Greece that offers both undergraduate and postgraduate programs with the method of distance learning. The educational procedure approaches the blended learning model combining online and in-person learning through limited number of tutor-student sessions. Aiming at changing the landscape of higher distance education in Greece, HOU, since 2016, is offering new programs that introduce several innovations. In continuity of past work regarding students' perspectives of new programs, we examine tutors' opinion about educational content, educational activities, tutor-student sessions and general difficulties they confronted concerning their tutor role, using mostly qualitative analysis. We used a sample of ninety tutors working in two postgraduate programs; one program is in the field of Humanities and the second in the field of Social Sciences. All tutors who participated and answered the questionnaire were tutoring for at least one academic semester. By using students' point of view described in previous work, we compare tutors' opinion. The results can be used to offer effective academic, pedagogical and administrative (if needed) support to tutors along with improvement of digital material and tutor-student sessions which are important elements of blended and online learning.

**Keywords:** higher education, blended and online education, tutors' perceptions

### **1. Introduction**

Hellenic Open University (HOU) is the unique distance learning university in Greece. With the vision of enhancing its educational service offering, since 2016 HOU is offering new programs that introduce several innovations (Kalantzi, Sideris, Spyropoulou & Androulakis, 2016). The newly established (mostly postgraduate level) programs provide educational material, which includes multimodal content, offered exclusively in digitally format through the learning platform. Moreover, digital interactive educational activities (EA) enhance and support distance learning. In particular, students test their knowledge with close-ended and open-ended online tasks, participate in educational forums, collaborate in wikis and other team activities and play educational games. Tutors give students feedback for all EA. Last but not least, students have the opportunity to select participating in Tutor-Student Sessions (TSS) online instead of face-to-face. Following previous work regarding students' opinion about education material, educational activities and TSS, in this paper we examine tutors' perceptions of the above in addition to encountered difficulties during TSS and general difficulties participants faced related to their role as tutors. Finally, we indicate common points between tutors' and students' comments.

## 2. Background

As mentioned above, HOU offers both undergraduate and postgraduate programs with the method of distance learning. Learning Management Systems and a limited number of face-to-face TSS support the educational procedure. This model approaches blended and online learning (Antonelou, Verykios, Kalantzi, Panagiotakopoulos & Stavropoulos, 2015). During TSS tutors familiarize students with the process of distance learning and provide them advice, support and general academic guidance. Also, it is a way to interact with each other and be part of a team. Students have the option to select online TSS instead of the traditional face-to-face TSS. In this case, we define the educational model as blended online learning. Blended online learning is a variation of blended learning where synchronous online learning via web conferencing replaces traditional face-to-face tutoring (Fadde & Vu, 2014). One benefit for students, among others, is the economies' achieved due to reduction of travel expenses and the corresponding time spent on transportation. However, plenty of challenges emerge. First of all, tutors and students have to get familiar with the web conferencing tool. Furthermore, tutors have to decide which instructional methods are enhanced by synchronous interaction and aim the purpose of TSS (Fadde & Vu, 2014). To achieve this point though, tutors may need pedagogical training and technical support (Fadde & Vu, 2014). According to prior research results (Palloff & Pratt, 2013), some important elements for successful blended and online learning are collaborative and interactive educational activities, flexibility about time and pace of learning, immediate feedback and educational content in various formats (video, audio, podcasts, etc.)

## 3. Method

New programmes and courses require the synergy between the academic teams and the instructional designers of the Educational Content, Methodology and Technology Lab (e-Comet Lab), an independent unit of HOU that assists the structuring, development and quality assurance of educational material and methodologies implemented by HOU. Thus, the program structuring, digital material development, on-line tutoring methods and the use of the LMS and conferencing platforms need close collaboration between the involved teams and frequent assessment of the quality and successful operation of each program. In order to examine tutors' opinion about educational material, educational activities, TSS and general difficulties participants confronted concerning their tutor role, we created a questionnaire with open-ended questions. The questionnaire included also four closed-ended questions about participants' sex, age, experience in Open and Distance Learning (ODL) and the time they needed per week to fulfil their duties as tutors. We created the questionnaire using Google Forms and we asked tutors to fill in it sending them an e-mail. We followed grounded theory for the construction of a theory through the analysis of data (Yancey, Martin & Turner, 1986). Furthermore, we used thematic analysis for the qualitative analysis of data. In particular, the steps we followed are: 1) familiarizing with the data, 2) generating initial codes, 3) searching for themes, 4) reviewing themes, 5) defining and naming themes and 6) writing the report (Braun & Clarke, 2006). The procedure was supported by NVivo software (version 10). Finally, for ensuring research validity, the authors followed a crosscheck procedure of the results.

### 3.1 Sample

The sample of the research is tutors (N=90) of two new postgraduate programs during the winter semester of the academic year 2018-19. 57,6 % of them were tutors in a program in the field of Humanities and 42,4% in the field of Social Sciences. All participants had experience in ODL as they were tutors in HOU for at least one academic semester. The majority of participants were female (66,03%). As far as the age is concerned, half of the tutors were between 40 and 49 years old (51%). Regarding the time devoted per week on course preparation and student support, the two most popular answers are between 5 and 15 hours (42%) and between 15 and 25 hours (34,4%).

#### 4. Results

We present the results of the research per question as follows: comments for the educational material and suggested improvements, comments for the educational activities and suggested improvements, the contribution of TSS on the educational procedure, non-technical difficulties participants encountered during TSS and general difficulties concerning their tutor role.

##### 4.1 Educational material

Initially, participants commented the educational material of the course. After the coding process, we grouped tutors' comments into different thematic axes, Positive Comments and Negative Comments.

Relating to positive comments, Table 1 displays the percentages of references per theme. Most of the references (21%) cite that educational material is clear, understandable and well written. 17,5% of them characterize it complete and 16% useful and auxiliary. 14% mention it as relevant and the 11% as excellent. The theme *Other* (6,5%) includes various comments such as "*It's multidimensional*" and "*It also helps students develop skills beyond the subject matter's knowledge, such as how to search for reliable online resources, how to create a presentation and how to write assignments*". Moreover, according to tutors educational material is also updated and contemporaneous (5%), suitable (3,5%), with practical application (2,5%), rich (2%) and interactive (1%).

Table 1: Themes and frequencies of Positive Comments Themes

Themes of Positive Comments	Number of references	Percentage
Clear, understandable and well written	42	21%
Complete	35	17,5%
Useful and auxiliary	32	16%
Relevant	28	14%
Excellent	22	11%
Other	13	6,5%
Updated and contemporaneous	10	5%
Suitable	7	3,5%
With practical application	5	2,5%
Rich	4	2%
Interactive	2	1%
Total	200	100%

Regarding the axe Negative Comments, Table 2 shows the number of references per theme. The description *Incomprehensible* receives the majority of the comments (31,3%). 25% of the comments reports that the education material needs improvement and 12,5% that is without cohesion. A total of 6,3% refers to the comments characterizing the material as *challenging, bad, not clear, not adequate* and *overlapped*.

Table 2: Themes and frequencies of Negative Comments Themes

Themes of Negative Comments	Number of references	Percentage
Incomprehensible	5	31,3%
Needs improvement	4	25%
Without cohesion	2	12,5%
Challenging	1	6,3%
Bad	1	6,3%
Not clear	1	6,3%

Not adequate	1	6,3%
Overlapped	1	6,3%
Sum	16	100%

About suggested improvements, 15 tutors (16,6%) mention that the educational material does not need improvements. The improvements that suggest the rest of the tutors are referred in Table 3. Most of the comments propose enrichment of the educational material (29,1%) and some of them indicate specific fields (e.g. *"More clinical examples focused on the elderly"*). Other improvements suggest update (20,3%), conversion in Greek language (11,4%) and addition of educational material in English language (8,9%). In the theme *Other* we find comments, such as *"It could be less densely written"* and *"Changing parts of the educational material"*. Other suggestions include reduction of the educational material (7,6%), adding more audiovisual material (3,8%), correcting the errors (2,5%), rearrangement of study weeks (2,5%) and emphasizing on specific parts of educational material (2,5%).

Table 3: Themes and frequencies of suggested improvements of educational material

Themes of suggested improvements of educational material	Number of references	Percentage
Enrichment	23	29,1%
Update	16	20,3%
Other	9	11,4%
Conversion in Greek language	9	11,4%
Addition of educational material in English language	7	8,9%
Reduction of educational material	6	7,6%
More audiovisual material	3	3,8%
Error correction	2	2,5%
Rearrangement of study weeks	2	2,5%
Emphasis on specific parts of educational material	2	2,5%
Sum	79	100%

Examining previous work described in (Spyropoulou, Kalantzi, Sideris & Androulakis, 2017a) we conclude that regarding positive comments, students and tutors have the same opinion about the good quality of educational material. About negative comments, the majority of both students and tutors state that educational material is difficult to understand. Finally, similarly with the tutors who propose enrichment and update, students suggest update and access to more complementary bibliography.

#### 4.2 Educational activities

Following the evaluation of educational material, we studied tutors' opinion about the contribution of EA in the educational procedure. Table 4 presents the themes that emerged and the corresponding percentages per theme. The majority of the comments (87,7%) indicate a positive impact of EA. A big number of tutors give a general characterization for EA or express their personal opinion without further explanation regarding EA's contribution. Tutors comment EA as helpful (8,6%), well-designed and structured (4,3%), satisfactory (3,6%), interesting (2,9%) and with significant contribution (7,9%). The theme *General characterization* (7,2%) includes comments like *"Educational activities were appropriate and adequate"* and *"Educational activities are very good"*. With reference to comments about contribution, tutors believe that EA help students be more actively involved in the learning process (10,1%) and give them feedback about their progress (7,9%). Also, EA use students' prior knowledge (7,2%) and help them understand the educational material (6,5%). Moreover, EA enhance their critical thinking (4,3%) and can contribute to students' motivation (2,9%) and student-tutor interaction (1,4%). Last but not least, according to tutors, EA is a way for students to apply



their theoretical knowledge (4,3%) and practice through close-ended questions (1,4%). As far as the negative comments are concerned, tutors mention various issues. Some examples follow: *"It is good to emphasize on active involvement of students"*, *"Some quizzes do not give the correct answers and confuse students"*, *"Unfortunately, students' participation in discussions was very limited. This did not allow for exchange of knowledge, experience and different approaches from different specialties."*, *"There is no interaction between students as a group and the tutor"*.

Table 4: Themes and frequencies of contribution of educational activities

Themes of suggested of the contribution of educational activities	Number of references	Percentage
Negative comments	17	12,2%
Students are actively involved	14	10,1%
Helpful	12	8,6%
Significant contribution	11	7,9%
Give feedback	11	7,9%
Other	10	7,2%
General characterization	10	7,2%
Utilization of prior knowledge	10	7,2%
Help understand educational material	9	6,5%
Well-designed and structured	6	4,3%
Enhance critical thinking	6	4,3%
Application of theoretical knowledge	6	4,3%
Satisfactory	5	3,6%
Interesting	4	2,9%
Enhance student motivation	4	2,9%
Enhance student-tutor interaction	2	1,4%
Enhance students' practice	2	1,4%
Sum	139	100%

We describe tutors' suggestions for improvements in EA in Table 5. As we notice the majority of references, (29%) indicates addition of specific types of EA. We cite some typical examples: *"Activities aiming at developing critical thinking"*, *"Group assignments"*, *"More case studies"* and *"More quizzes"*. Furthermore, the participants propose reduction of the number of EA (20,3%) because they find them too many. Another recommendation is update and renewal of existing EA (18,8%). It is also suggested error correction and clarifying some EA (5,8%), adding more difficult EA (4,3%), increasing the number of words in EA's answer (2,9%) and motivating students to become more active in forums (7,2%). The theme *Other* (11,6%) consists of comments that are not coded in the above themes, such as, *"Compulsory activities should be more than 5"* and *"Reduction of text summary activities"*.

Table 5: Themes and frequencies of suggested improvements of educational activities

Themes of suggested improvements of educational activities	Number of references	Percentage
Addition of educational activities	20	29%
Decrease of the number of educational activities	14	20,3%
Update and renewal	13	18,8%
Other	8	11,6%
Participate in forums	5	7,2%
Clarifications and error correction	4	5,8%
More difficult educational activities	3	4,3%

Increase the number of words in the answer	2	2,9%
Sum	69	100%

Taking into consideration previous work (Sideris, Spyropoulou, Kalantzi & Androulakis, 2017) both students and tutors refer EA's positive impact on educational procedure. In particular, they comment about EA's contribution on the development of critical thinking and the significance of feedback. On the other hand, both students and tutors suggest reduction of the number of educational activities.

#### 4.3 Contribution of TSS

We examined tutors' opinion about the contribution of TSS. In particular, we ask them if they find TSS supportive for educational procedure and in what way. All participants gave positive answers. Table 6 presents the number of references per theme. The majority of references (26,7%) indicate that according to tutors, TSS are supportive since they can be utilized for resolving students' questions. Next with 21,2% responses about the interaction, communication and discussion between students and tutors and students as a group that are developed and enhanced during TSS. Examples of comments are *"It is an opportunity for synchronous interaction"* and *"Enable students to communicate more directly with the tutor"*. 13% of the references mention that during TSS important or difficult parts of educational material and educational activities are clarified and explained. Other opinions report that TSS help developing a group spirit (*"Provide students with the opportunity to feel part of a group"*), contribute to students' general guidance about educational procedure (*"...better informing about course's requirements"*) and offer an opportunity for students and tutors to become acquainted with each other (*"Helped students get acquainted with tutors and students with each other"*). In addition, was reported that during TSS, tutors solve problems (3,4%), encourage students (2,7%), give feedback (2,1%), summarize educational material (1,4%), and create the didactic contract (0,7%). Finally, 9,6% of references mention a positive answer without further analysis on how TSS are supportive for educational procedure.

Table 6: Themes and frequencies of the contribution of TSS

Themes of the contribution of TSS	Number of references	Percentage
Answering questions	39	26,7%
Interaction-communication-discussion	31	21,2%
Clarifications	19	13%
Yes, without further analysis	14	9,6%
Teamwork	10	6,8%
General guidance	9	6,2%
Become acquainted with each other	9	6,2%
Problem solving	5	3,4%
Students' encouragement	4	2,7%
Give feedback	3	2,1%
Summarization	2	1,4%
Didactic contract	1	0,7%
Sum	146	100%

Examining previous work (Spyropoulou, Kalantzi, Sideris & Androulakis, 2017b) we conclude that tutors and students mention common positive aspects of TSS, which are interaction and communication between students and tutors and students with each other and resolving students' questions.

#### 4.4 Difficulties during TSS

In this subsection, we examine the non-technical difficulties tutors encountered during TSS. 61,4% of tutors answered that they encountered none difficulties during TSS. Table 7 presents the themes and the number of references. We notice that the majority of the comments (33,3%) concern students' participation in TSS. In more detail, tutors cite that students did not participate at all or they were not sufficiently active during TSS. Examples of comments are *"There is a problem with low student participation"* and *"Students didn't speak so TSS often was a monologue"*. The 29,6% of the comments mention technical difficulties although they were excluded by the question. Examples of comments in the *Other* theme (18,5%) are *"Customer logic of some students"* and *"Students' obsession with the semester assignment"*. In addition, tutors mention as difficulties during TSS the impersonal communication with the students (11,1%) and the long duration (7,4%).

Table 7: Themes and frequencies of the difficulties during TSS

Themes of the difficulties during TSS	Number of references	Percentage
Students' participation	9	33,3%
Technical difficulties	8	29,6%
Other difficulties	5	18,5%
Impersonal communication	3	11,1%
Duration	2	7,4%
Sum	27	100%

Comparing with previous work (Spyropoulou et al., 2017b), students mention technical problems too. In the contrary with students, tutors do not report major difficulties concerning the time duration and frequency of TSS. In (Spyropoulou et al., 2017b) students suggest *"...TSS should last less and be more frequent"*.

#### 4.5 General difficulties

Finally, the participants cite general difficulties they confronted concerning their role as tutors. 21,5% of tutors answered that encountered none difficulty. Table 8 describes the percentages per theme. We notice as the most common difficulty for tutors (17,4%) the big workload that means they dedicated many hours (the majority of them between 5 and 15 hours per week) supporting students, for example correcting their weekly assignments. Some examples of tutors' comments are *"The difficulty is generally related to the workload at all levels (students' support and guidance, correction of assignments, give feedback, preparation for TSS, etc.)"* and *"There are many duties and we must be constantly on the alert"*. Follow difficulties related to educational procedure (15,9%), for example *"Encourage students to participate in forums"* and *"I have been in a difficult position due to a very high plagiarism rate"*. Technical difficulties and administrative-procedural issues share the third place (14,5%). Tutors comment *"Lack of technical support during TSS"*, *"Late payment"* and *"Last minute assignment of the courses"*. Other difficulties are related to educational material (*"It was difficult to justify the choice of educational material"*) and students' complaints for their grades (*"Ironic behaviors when the grades were low"*). The theme *Other* (7,2%) consists of various comments such as *"It was difficult to answer students' questions on issues that are responsibility of HOU's administrative departments, eg. exam date"* and *"Answering vocational rehabilitation questions"*. Finally, we notice that other difficulties are connected with tutors' evaluation (4,3%), lack of interaction with students (4,3%) and students' heterogeneity (2,9%).

Table 8: Themes and frequencies of the general difficulties

Themes of the general difficulties	Number of references	Percentage
Workload	12	17,4%

Educational procedure	11	15,9%
Technical difficulties	10	14,5%
Administrative-procedural issues	10	14,5%
Educational material	8	11,6%
Students' complaints for grades	5	7,2%
Other	5	7,2%
Tutor's evaluation	3	4,3%
Lack of interaction with students	3	4,3%
Students' heterogeneity	2	2,9%
Sum	69	100%

## 5. Conclusions

In this paper, we describe tutors' perceptions about the contribution of material and interactive activities in a blended and online educational environment for adults. In addition, participants suggest improvements, express their opinion on how TSS support educational procedure and state general difficulties they confronted as tutors.

The majority of tutors report educational material's positive impact on learning procedure. In particular, they mention as a benefit how clear, understandable and useful it is, along with its completeness and relevance to course's subject matter. On the other hand, some tutors find educational material incomprehensible for students. Most of the tutors do not propose improvements except a small number who suggest that educational material should be updated and enriched with additional bibliography.

Regarding educational activities, the biggest number of comments mention a positive contribution in educational procedure. According to tutors, weekly EA help students be actively involved in educational procedure, understand educational material in depth and connect theory with practice. In addition, tutors believe that EA enhance students' abilities like critical thinking and motivation. Participants mention the importance of feedback and utilization of prior knowledge in adult education although they suggest adding specific types of EA and reduction of their number.

During TSS tutors answer students' questions while clarifying and explaining difficult or important parts of educational material. Also, it is a way for students to interact and communicate with other students and tutor. Students' low participation is a common issue for tutors along with technical difficulties. In general, tutors find their occupation demanding since they had to spend many hours in order to fulfill their duties.

We find several similarities between tutors' and students' opinion described in previous work. Both mention the good quality of educational material but some of them comment parts of it as incomprehensible and claim that needs updating. Thus, we propose reviewing of existing material from academic and pedagogical perspective and development of new one using open and distance learning methodology. Both tutors and students recognize EA's positive contribution on the educational procedure but they propose reduction of their number. Last but not least, tutors and students emphasize on the interaction and communication that is built between students and tutors and students with each other during TSS however they cite technical problems.

Certainly, the role of teaching staff in blended and online adult education is important and therefore about how institution supports tutors is a question under discussion (High Level Group on the Modernisation of Higher Education, 2014). This research contributes in understanding their needs in order to support them more effectively from academic and administrative perspective. Their suggestions are important for existing

and new courses' quality assurance. In the future, we plan to develop a more formal evaluation procedure of tutors' point of view aiming at improving the provided services for tutors and students.

#### ACKNOWLEDGEMENTS

The research was conducted in the context of subproject code 80008 of project entitled "Educational Content, Methodology and Technology Laboratory (e-CoMeT Lab)", code 80006, funded by Special Account for Research Funds.

#### 6. References

Antonelou, G., Verykios, V., Kalantzi, R., Panagiotakopoulos, Ch. & Stavropoulos, I. (2015). Supporting Face-to-Face Live Sessions in Hellenic Open University based on Blended Learning Approaches and ICT tools. In A. Lionarakis (Ed.), *8<sup>th</sup> International Conference in Open & Distance Learning, 7-8 November 2015, Athens, Greece* (pp. 72-80). Athens: Greek Network of Open and Distance Education.

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101.

Fadde, P. J., & Vu, P. (2014). Blended online learning: Benefits, challenges, and misconceptions. *Online learning: Common misconceptions, benefits and challenges*, 33-48.

High Level Group on the Modernisation of Higher Education (2014). *Report to the European Commission on New modes of learning and teaching in higher education*. Luxembourg: Publications Office of the European Union. Retrieved from European Union website: <https://publications.europa.eu/en/publication-detail/-/publication/fbd4c2aa-aeb7-41ac-ab4c-a94f6ea9eb1f>.

Kalantzi R., Sideris D., Spyropoulou N. & Androulakis G. (2016). Changing the Gear: Adopting Inter-Institutional Collaborative Course Development as the Policy for Distance Higher Education in Greece. In G. Ubachs (Ed.), *The Online, Open and Flexible Higher Education Conference. Enhancing European Higher Education "Opportunities and impact of new modes of teaching", 19-21 October 2016*, (pp. 61-68). Rome: European Association of Distance Teaching Universities and the authors.

Palloff, R. M. & Pratt, K. (2013). *Lessons from the Virtual Classroom (2nd Ed)*. San Francisco, CA: Jossey-Bass.

Sideris D., Spyropoulou N., Kalantzi, D., Androulakis G. (2017). Empowering the educational procedure through interactive educational activities in distance higher education. In Gómez Chova L., López Martínez, A. Candel Torres I. (Eds.), *International Conference of Education, Research and Innovation (ICERI17), 17-19 November* (pp. 6089-6094), IATED Academy.

Spyropoulou N., Kalantzi, D., Sideris D., Androulakis G. (2017a). Adoption of exclusively e-content in distance higher education: the student experience. In Gómez Chova L., López Martínez, A. Candel Torres I. (Eds.), *Proceedings of International Conference of Education, Research and Innovation (ICERI17), 17-19 November* (pp. 6163-6170), IATED Academy.

Spyropoulou, N., Kalantzi, R. Sideris, D. & Androulakis, G. (2017). Newcomer Students' Perspectives on Online Tutor-Student Sessions in Distance Higher Education. In Pixel (Ed.) *Future of Education International Conference, 7th Edition, Florence, Italy, 8-9 June 2017*, ISBN: 978-88-6292-868-7, ISSN: 2384-9509 (pp 163-168).

Martin, P. Y., & Turner, B. A. (1986). Grounded Theory and Organizational Research. *The Journal of Applied Behavioral Science*, 22(2), 141–157. doi.org/10.1177/002188638602200207.

## VetTrip, a playful methodology for training in university environment

### Arián Yahyaee

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
ayahyaee@invi.uned.es

### María del Mar Espinosa

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
mespinosa@ind.uned.es

### Roberto Prádanos

Universidad de Valladolid, Valladolid. España  
robertoenrique.pradanos@uva.es

### Manuel Domínguez

Universidad Nacional de Educación a Distancia (UNED), Madrid. España  
mdominguez@ind.uned.es

### Abstract

This article includes, first of all, the approach to the VetTrip methodology, a teaching game valid in university environments. This methodology, used originally in health environments and in face to face way, can be used in other teaching environments and in a distance education. The transformation is done towards the DibTrip project, developed at the Universidad Nacional de Educación a Distancia of Spain (UNED), within the framework of a school of industrial engineers and at the level of a zero course to access to university degree.

The DibTrip project is therefore presented and the results obtained after two development editions of the project are too presented. The results are globally positive, but it is interesting to analyze the perspective received by the students, especially those older, who do not understand well the approach and warn of the risk that is felt with such projects, as they may induce that the university and the engineering degree are a game, when it is really far from it.

**Keywords:** VetTrip, Gaming, Zero course, DibTrip, Technical drawing, Demotivation.

### 1. Introduction

There is a constant controversy about education, considering whether to learn it is necessary to make an effort, sometimes not pleasant, or we can learn by playing. There is no doubt that the human being learns, from the beginning, by playing. But that does not mean that there is no need to make an effort too. The difference is not to make effort or not to make effort, but to do something nice and motivating or something not so pleasant and sometimes demotivating.

There are many references to playful learning projects in primary and secondary education environments. But not so many are located in the university education. This article presents a playful learning project, based on the VetTrip methodology, which is being used in the zero course of Technical Drawing for students who wish to enter the engineering studies at the Spanish University of Distance Education - UNED.



## 2. Approach

In this work we are going to show the problems and the conclusions reached in the development of a playful activity framed in a Zero Course of technical drawing, a preliminary course of a voluntary nature, to access the engineering degree of at the Spanish University of Distance Education (Universidad Nacional de Educación a Distancia - UNED).

The reason for this Zero Course was the relatively high dropout rate of students in the early years of the degree; and the idea was to organize a zero course in which the basic training necessary to be able to face the engineering university degree with a minimum guarantees of success.

One of the factors that most influences this relatively high dropout rate of our students is their access profile (Romero, Romero, Jiménez, Espinosa, & Dominguez, 2015). UNED is a university that eighteen-year-olds do not access when they finish their high school studies, as they normally go to the face-to-face university of their geographic environment. The average age of access for our students is above twenty-five years old; and their previous training is really wide. Some students access after having completed another university degree, but others come in after passing a course of access to the university for over twenty-five years old, which makes their basic training in technical drawing can be null (Vallecillo et al., 2018a). Between them are students who, for whatever reasons, have not completed their studies at other universities and those who wish to enter university after vocational training sometimes even within the field of engineering or delineation. As indicated in the title of this work, this article sets out the playful distance alternative of the game VetTrip (Domínguez, 2017) in an internet version.

University classes at UNED begin in early October, so this previous Zero Course training should be planned to be taught before classroom opening. The scheme of operation of this course has been to have an open site for twelve months of the year, with an approach to self-training (M. del M. Espinosa & Dominguez, 2000); and two tutorial attention periods ranging from June 15th to July 15th, the first, and from September 1st to September 30th the second. It is during those two attention periods tutorial when the object game of this article is developed.

The fact of including a playful activity in this zero course through the internet makes it necessary to use information and communications technology (ICT) in its entire capacity (M. M. Espinosa, Núñez, & Domínguez, 1999)(Martin-Erro, Dominguez, & Espinosa, 2016); while all the technology available in UNED's methodological systems has been dumped in the structure of the game and course, and new approaches have been sought to optimally solve the problems in this graphic subject (Iserte, Espinosa, & Domínguez, 2012)(Salido, Bernal, & Domínguez, 2002)(Vallecillo et al., 2018b)(Prádanos et al., 2009). In addition, in order to motivate students who develop this course, a playful-teacher activity has been raised whose approach, development and achievements constitute the objective of this work.

## 3. VetTrip methodology

VetTrip is a playful-teacher activity with clearly nice and formative objectives. In origin its theme gyrates around veterinary medicine in all its branches, including health. But it also contains questions about curiosities of the animal world and about the presence of animals in film, literature or painting, which reaffirms the playful approach (figure 1).

It is not specific to veterinarians or to veterinary students. Its objective is the diffusion of knowledge, so you do not need to have a lot of knowledge or a veterinary degree to play (or to win), and this is where the real interest of the methodology lies.

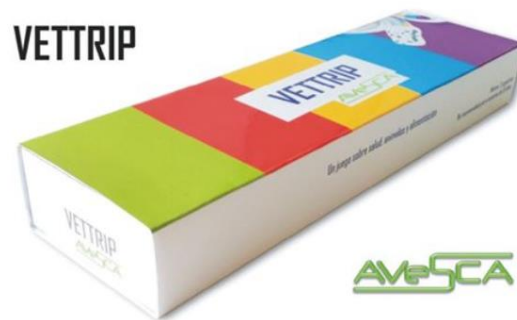


Figure 1. Packaging of VetTrip

It has been created by the Veterinary Association for Health and Food Quality (Asociación Veterinaria para la Salud y la Calidad Alimentaria - AVEsCA) with technical support from the area of Design Engineering of the UNED (figure 2).



Figure 2. AVEsCA site in internet (www.AVEsCA.es)

The game consists of these basic elements:

- A series of questions cards, with several possible answers, the right answer to each of these questions and a brief clarifying comment (figure 3 right).
- Counting pieces (figure 3 left).
- A board (figure 4).

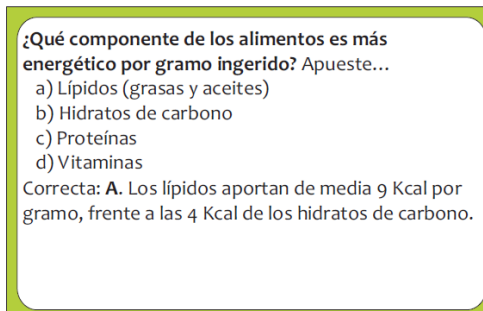
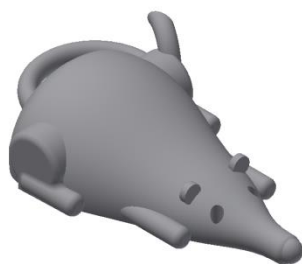


Figure 3. VetTrip game pieces and quiz card

The account is made with 3D printed pieces, in this case shaped like a mouse (figure 3 left), simulating an animal that has been eaten by a snake and that must be able to get rid of the snake thanks to its skills and knowledge. No dice or chance's system is necessary as it is a game of sharpness and knowledge.

The board (figure 4) is a tour inside the snake. Here are the steps you have to follow so that the game can be well understood:

1. The game can work individually or by teams (Romero, Domínguez, Espinosa, & Domínguez, 2015). A minimum of three players or teams are recommended, although exceptionally two of them may be accepted, and a maximum of six. There could be more teams but in this case the game gets a little slow. It is interesting to form teams because this way the players can comment in the group before responding, so the chances of getting the right answer are greater.
2. Place the pieces in the zero box and choose a target (feed the snake or release the little mice), which should be common to all equipment.
3. Read, randomly choosing a theme/colour question card where the mouse is located in turn on the board.
4. Bet a number of squares to advance, minimum 1 and maximum 5, bearing in mind that you cannot match another mouse in the same box (neither forward nor backward).
5. Read the four possible answers.
6. Choose the one deemed correct.
7. Read the correct answer and explanation, if appropriate.
8. Move forward or backward the staked squares (if it is hit it advances and, if not, it is reversed). If the piece reaches the end of the snake that is not its target, it loses a turn and restarts in the zero box.
9. Turn the next team and continue like this until someone reaches the target and the round is completed (to give the same chances to win to all players or teams, regardless of who started).

The five types of questions available on VetTrip are Food (green), Diseases (red), Body (yellow), History and Arts (purple), Animals (blue).



Figure 4. The VetTrip game box and board

#### 4. Reference frame of our distance university

A face-to-face university is headquartered in one location and sometimes has a location in three or four other locations. A university such as UNED is headquartered in more than seventy locations (figure 5) some of them outside the national territory.



Figure 5. Distribution of UNED Associated Centres worldwide (course 2018-19)

The profile of the students of the UNED differs in an important way regarding the profile of the students of the public universities, especially in three variables:

**Age:** while at universities face-to-face only 15% of its graduates of master and degree have more than 30 years, at UNED this collective is 78%.

**Prior professional experience:** a feature, closely linked to the previous one, is that a high percentage of the students of the UNED students already had extensive training and work experience on their backs: only 26% of the graduates were to start their qualifications looking to have their first work experiences, compared with 34% who were in an intermediate professional stage and 30% on a consolidated professional stage, with extensive professional experience.

**Motivations to carry out the degree:** the motivations are quite varied. In particular, within the business motivations is largest to promote the profession to the get new or first work experiences. A significant number also seeks with his studies of the UNED reoriented her career towards a new profession.

Regarding the employment situation and the changes produced, we have the following information:

**Changes in the employment situation:** Among those who did not work at the end of the degree, 56% were working two years later. Thus, of the total sample, 71% worked at the end, while at two years this percentage has risen to 81%. In addition to this positive data, the unemployment rate passed between these two moments from 16% to 11%, which represents a decrease of 31% in the percentage of unemployed.

**Changes perceived in the work:** The graduates who kept their work between the end of the degree and two years later were asked about the changes perceived in the work in different issues. There were hardly changes to worse. Although a majority maintained the labour category and their wage and non-wage labour conditions, between 41% and 46% reported having improved in these three aspects. In addition, with regard to functions and tasks, the majority reported having undergone changes for the better (47%).

From all the above it follows that the UNED students have certain peculiarities in terms of age, work experience and motivations to study.

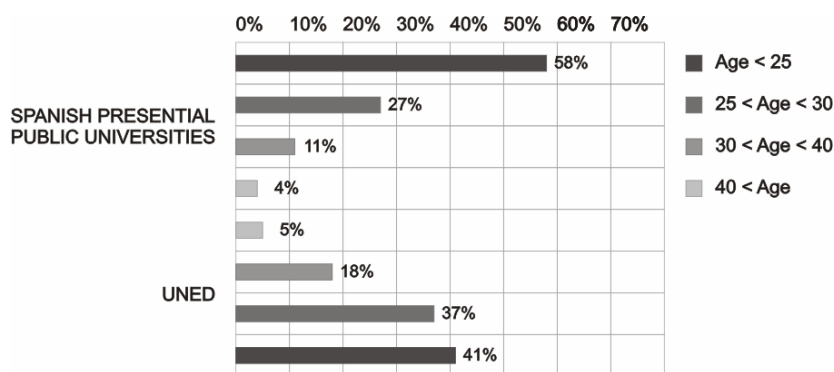


Figure 6. Distribution of graduates of the 2016/2017 course by age group

Figure 6 shows a comparison of the distribution by age of the graduates of master's and degree of the UNED and the rest of Spanish public universities, verifying enormous differences. In public universities, 58% of the graduates are under 25 years old, while in the UNED the graduates of this age group only represent 5% of the total. On the contrary, in the UNED, graduates of 31 or more years are 78%, while in the rest of public universities they represent only 15%.

These data show that the graduates of the UNED, with respect to the rest of the Spanish public universities, are of much more advanced ages and, therefore, it would be expected that they have a greater previous experience, both work and training. This question is clearly seen in figure 7, which shows the professional stage in which the graduates were at the time of beginning their degree and master's degrees. Thus, only 26% were in an initial stage at work, looking for their first work experiences, compared to 34% who were in an intermediate stage and 30% in a consolidated stage of extensive experience. Likewise, there is also a relevant 8% of the graduates of the UNED who indicated that at the beginning of the degree they were looking to change their profession.

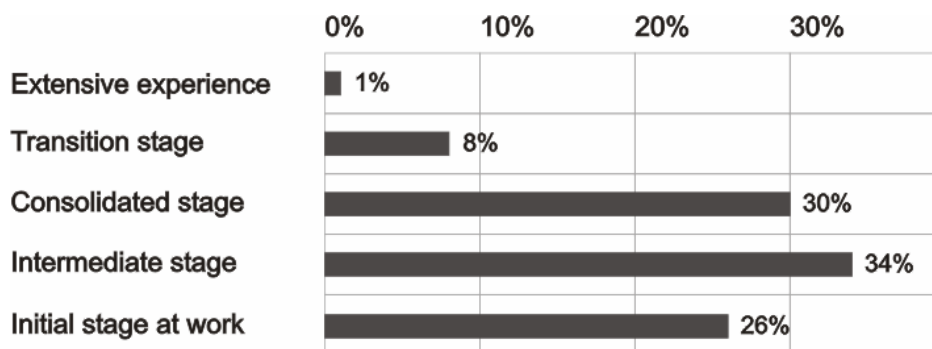


Figure 7. Professional stage before starting the degree

This aspect introduces us to the third differential dimension of the UNED with respect to what might be supposed of the face-to-face universities: the motivations to carry out the degree. Thus, if in the case of the young graduates of the face-to-face universities it is expected that it predominates as an interest to insert oneself for the first time in the labour world, in the case of the UNED the motivations are more complex and diverse, result of that student's profile with more established careers.

This we can verify in the figure 8, where besides the motivations extra-labour, such as personal development (marked by 60%) and vocation (38%), motivations such as academic promotion (28%) become important. But the highlight is that, within the motivations most strictly linked to improving the employment situation, the

labour insertion is not the most important (selected by 25%), but vertical labour mobility (38%). Also, an important 21% indicated horizontal labour mobility as the main motivation. That is to say, 38% indicated that promotion in their profession was among their main motivations to do the degree, and a fifth indicated as motivation the change of profession.

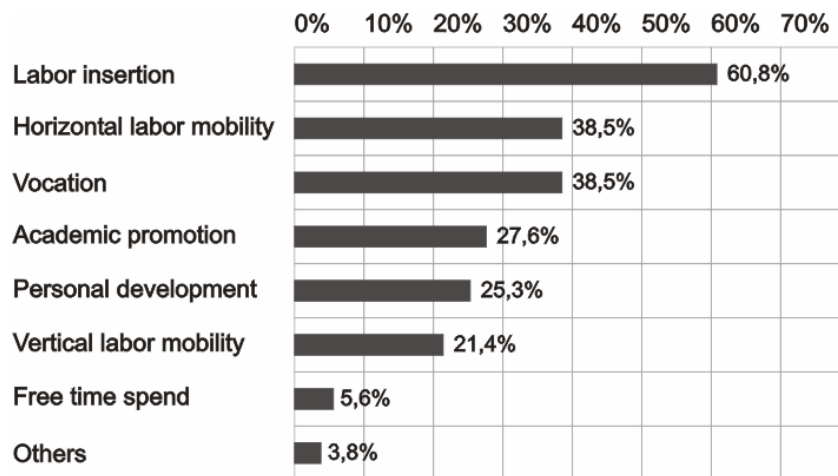


Figure 8. Motivations to carry out the degree

In summary, with the data provided we can confirm that, among the students of the UNED, in addition to those who seek their first experiences there is an important number that seek either to change their profession or, above all, promote within their profession (Vallecillo et al., 2018b).

On the other hand, in recent years the demand for distance, blended learning and online education has grown significantly in Spain (Prádanos et al., 2009). However, despite the increase in demand for this type of study, the graduation rates of students in distance education is significantly lower than those of face-to-face education, even in students who carry out their distance studies with dedication to full time.

No doubt this situation occurs for a high rate of abandonment. Higher rates of abandonment not only should be of concern to the institutions which, like ours, are responsible for providing qualifications (Vallecillo et al., 2018b). The abandonment of studies may also have consequences of various kinds, namely:

The economic consequences for the institutions that support distance universities financially and both State and regional Governments because of the relationship between unemployment and the low-skilled persons.

Social impact, because higher education is an engine of economic growth in the territories, fundamental to promote the social and territorial cohesion.

Personal implications, because the abandonment of studies can negatively influence the self-esteem of people and their employability.

In our case we have significant drop-out rates, and determining the causes of abandonment is a challenge that, although complex, must be addressed. Often, the abandonment has been attributed to factors such as the traditional profile of the distance student «an adult person of middle age that makes his studies compatible with family and work responsibilities and that, therefore, devotes a limited time to study» but more beyond this profile, which on the other hand is changing in recent times, the abandonment can be attributed to different types of causes:



Administrative difficulties that have to do with the students access to the teaching and administrative organization of the institution.

Cognitive difficulties, related with the processing of the information that is provided to the students, mainly through written and audio-visual, as well as the workload required by the different subjects.

Affective-motivational difficulties, derived from the feeling of isolation experienced by students at a distance in relation to their institutions, their teachers and other students, which has been called "transactional distance" "distance deficit". These difficulties can be considered as challenges that our students face and for which the university can offer different types of support.

Therefore, the institutional response should be articulated around two axes: academic support (teaching, development of cognitive skills, evaluation and attention), and non-academic support, which is subdivided in turn in organizational support (advice to optimize the time of work and maintain the pace of the course, help to prioritize personal, professional and academic issues) and emotional support. The latter implies the development of motivation and the self-confidence of the students, as well as the management of stress, especially against the assessment. In this sense, as far as emotional support refers, there is no doubt that implementation of a system of mentoring and support students can give good results (M. M. Espinosa et al., 1999).

The abandonment occurs mainly in the first courses and in the early stages of the course, so it is essential to provide support from the beginning of the year, or even earlier. We estimate about 45% the defined rate of leaving early, in this case as students who fail to deliver any task, implying that the students remain in the institution about a month and a half. There is no doubt that any effort that is done to reduce these figures will have a positive impact on the academic activities of the University.

## 5. DibTrip methodology

Once we have shown how the game works in its original methodology, VetTrip, it will be easy to understand the transcription to the internet with questions regarding technical drawing specifically made for this Zero Course.

Figure 9 shows the home page of the course, and you can already see the contents in which the questions will be distributed, which are none other than those necessary to pass the entrance test to the Spanish university (Vallecillo et al., 2018b):

- Geometry and technical drawing
- Representation systems
- Normalization
- Graphical documentation of projects

The game is accessed through a public forum, where all students who want to play can enter (figure 10). The instructions are on the already commented root page (figure 9).



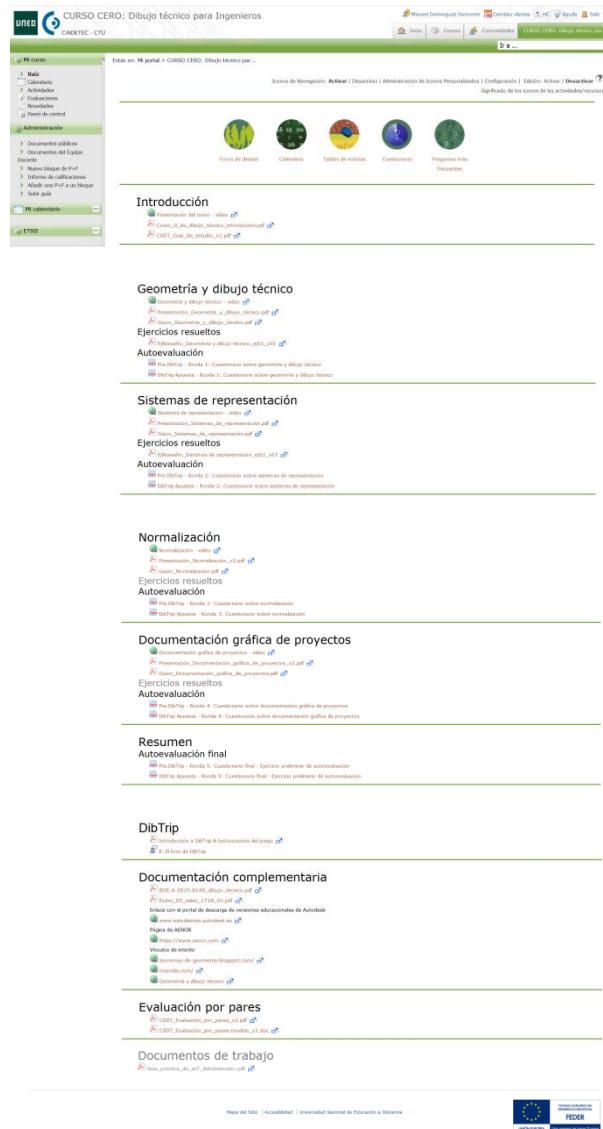


Figure 9. Zero Course home site

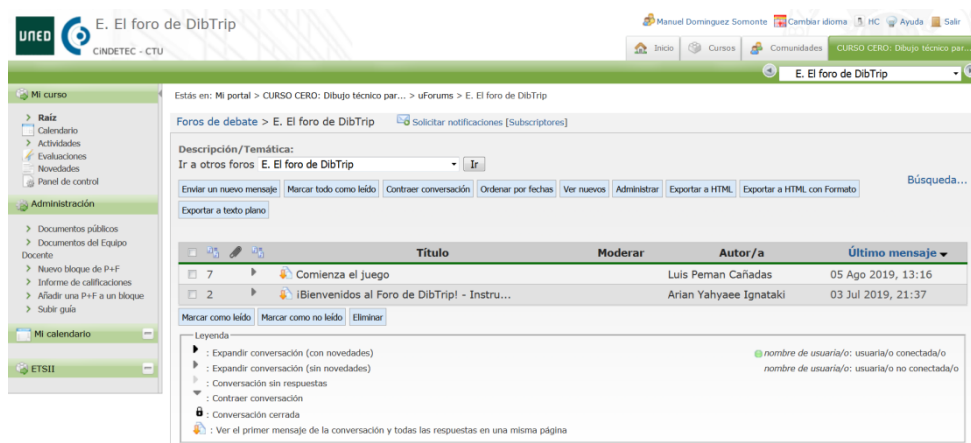


Figure 10. The DibTrip forum

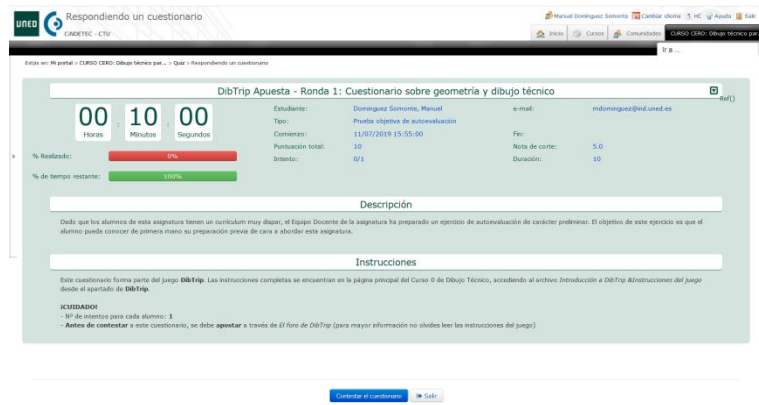


Figure 11. Access to the question quiz

The instructions page (figure 11) is accessed and it is followed by the game (figure 12).

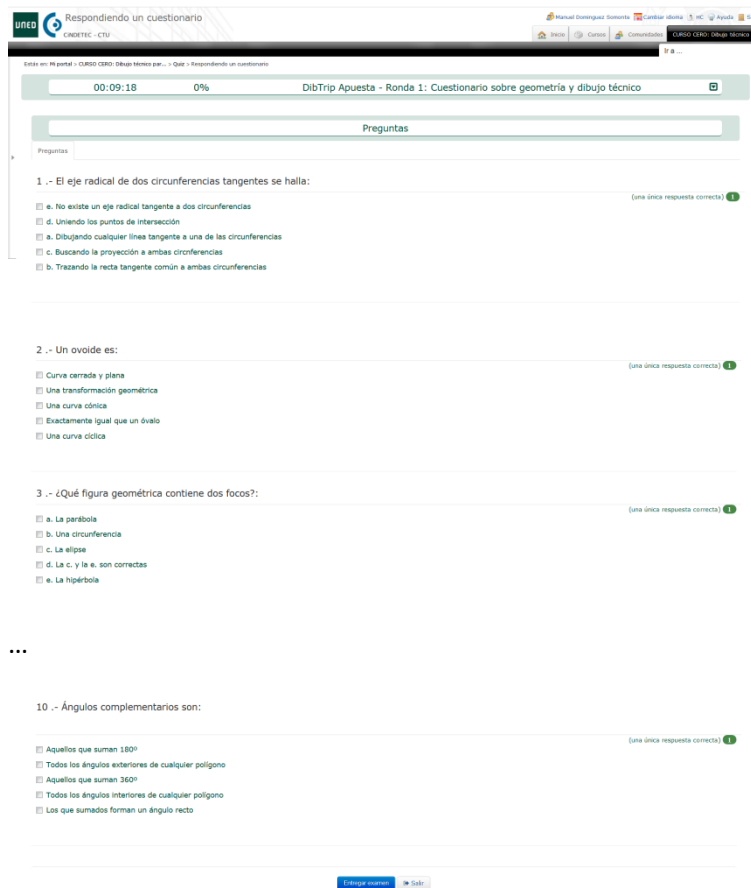


Figure 12. The quiz

DibTrip is a knowledge self-assessment game. Its question database brings together the content of the Zero Course and deals with the idea that it is important to know; but it is more important to be aware of what is known and what is not known. It is considered very important that, first of all, students are aware of their level of knowledge of the subject; this will be the best tool to choose the best way to go within their academic studies and thus be able to organize their training efficiently.

### 5.1 DIBTRIP instructions

The game has four rounds, one for each block of the Zero Course of Technical Drawing. Each round is divided into two parts. The first part is the bet: from 0 to 10, how many questions do you think you will hit?

For the game the student can use all the material he needs, according to the conclusions of the works of Espinosa (M. M. Espinosa et al., 2017), but with a limited time. At the moment the possibility of team running is not available, although it is an interesting goal (M. del M. Espinosa & Domínguez, 2003) that we are working on.

All players have 40 points at the beginning of the game. Before the player starts answering the quiz for each round of the game, the player will have to estimate how many questions he expect to hit, a simple but key question for the success.

Once you have answered this first question about the bet, the player will move on to the next part: the questionnaire itself. In it the player will find 10 questions (random generation) type tests of the scope of the respective block. Given the random generation of questions the student will actually find a wide variety of content that allow him to evaluate his level of knowledge.

As noted, students can take quizzes before entering in the game as a training or just out of curiosity. Each student has five attempts in total for each of the four quizzes in the Zero Course, but only one chance to play in each round.

Score. As noted, all players start with an initial amount of 40 points. As explained above, each player will have to bet, from 0 to 10, how many questions they expect to hit. If at the end of the questionnaire it turns out that the player has hit the number of answers wagered, then their points will increase in the number bet, otherwise their points will be reduced by the same number. If all are hit, up to 80 points can be earned. In the worst case, the player can lose his 40 points and stay at zero.

In this way the best knowledge of the matter is rewarded, on one side; but also, and above all, *know what is known*.

## 6. Discussion

Data from two editions of the game are available at the moment. In the beginning, students show their surprise at the choice they are offered, which makes some feeling really motivated while others take a step back, perhaps for fear to novelty.

The game is public; all players see the results of their teammates, although they can not see either the questions or details of the answers provided by the other players.

The number of students entering the Zero Course to «see what is» is quite high, but the number of students actively participating in the proposed activities is relatively low.

We have a very interesting educational game because we have been able to collect in it practically all the contents related to the subject of the high school curriculum. There is no doubt the course itself gives good service to students who access it, or at least that is indicated by the surveys; but we have to be realistic and look at the problem of student abandonment as it is, not as we would like it to be. The problem of student abandonment in the first few courses has many different causes; and if we want to address this problem we

must certainly work on each and every one of them. The first is that students at our university must combine university study with a job and, often, with family tasks.

Another added problem is that a university, of course, has a level and minimums to be met. More so if, as is the case, it is a school of engineers; where our students, when they exercise professionally, will have the responsibility to design and calculate structures that, if they are not well designed and calculated, can put the lives of many people at risk. The point we want to get to is that, in many cases, for one of our students to reach those minimums he must study much more time than a student from a face to face university (who normally spends four or more years in dedicating without having to balance a job or family tasks). If we assume that we are on a partial dedication we must be aware that we have to think in eight or more years, and that is a very long time frame for young people who are already around thirty years old and who after one or two years of dedication see very difficult a university degree in engineering.

Indeed, both Zero Course and the proposed playful activity has been quite useful for many of our students, because although until now they could solve with a particular teacher the same thing that they can solve now with this Zero Course, this option comes out for free.

## **7. Conclusions**

The development of the Zero Course that is shown in this work and the game that is the subject of this article have taken many hours of effort, dedication and programming to the computer scientists and teaching teams involved. Probably, if the profitability of the project is sought, the data that come out are not positive; but in these kind of projects and in our university, with an eminently social objective, there is no point in talking about economic returns.

The Zero Course and the DibTrip game help students in the months prior to their access to the university. They also fulfil the objective of reducing abandonment since with this course the students are more aware of its possibilities or limitations, and if they decide to go ahead they will certainly have greater chances of success.

The problem of dropping out of university classrooms at the university, in general, is a very complex issue. It is a situation that occurs both in face-to-face universities, where students are usually exclusively students, and in distance universities, where students must combine study with other activities. It is a situation that happens both in the degrees of letters and in the technical and science degrees; and certainly the training that comes with the student of the high school or his previous training is an important factor, but it must be realistic and, even if zero courses are set up that partially remedy these deficiencies, there will still be other important factors which should be influenced, otherwise the rate of abandonment will not be significantly reduced.

This does not mean at all that the development of such a Zero Course is an error. On the opposite, devoting resources to this project can open up many other expectations. With this Zero Course the student can know firsthand the knowledge level that will be required in the degree, and with it make an important decision with greater knowledge of the matter. With this Zero Course, university professors can see what is studied, or should be studied, in the high school; and adapt the contents of their subjects to that starting point, without causing jumps in the void or repeating contents that have already been taught in those previous phases.

In the Zero Course, in addition, students face the software technologies that they will then have to use in university studies, so if they manage these technologies they will have already taken an important step in their planning.

Thanks to Zero Course students can know firsthand their real possibilities of facing university studies, which will mean that in some cases they feel more confident in what they are going to do but, in other cases, it will imply that some students will abandon «before they begin»; which is no longer bad reason because with this approach the students probably won't lose those two or three years studying before quit and, not least, they will probably save money that we are sure none of them have left.

Finally, we must mention the surprise that some students receive, especially the older ones, when they encounter a game in a university environment. It is a situation that must be taken into account and that may need to be analyzed carefully in the future since, as we are told, the presence of games and playful activities in the courses may give the impression that the university studies and the training of the engineer degree is «a game», a situation that is far from reality.

## 8. Acknowledgements

This work has been made possible thanks to the support given by the Escuela Técnica Superior de Ingenieros Industriales of the Universidad Nacional de Educación a Distancia (UNED), within the framework of project ICF06-2019.

## 9. References

- Domínguez, R. (2017). *Vettrip: Un viaje de preguntas y respuestas a través de la veterinaria (1a)*. Madrid: Asociación de Ingeniería y Diseño Asistido (AIDA).
- Espinosa, M. del M., & Domínguez, M. (2000). Utilización de aulas virtuales en la docencia del dibujo técnico. II Congreso Iberoamericano de Informática Educativa Especial – CIIEE'2000, 6.
- Espinosa, M. del M., & Domínguez, M. (2003). La ingeniería concurrente, una filosofía actual con plenas perspectivas de futuro. *MetalUnivers*, 16, 16-20.
- Espinosa, M. M., Domínguez, I. A., Romero, L., Guerrero de Mier, A., Martín-Erro, A., Romero, M., ... Domínguez, M. (2017). Impacto de la utilización de material de consulta en los ejercicios de evaluación con tiempo limitado en los coeficientes de éxito en materias en el ámbito docente de la ingeniería. IX Jornadas de Redes de Investigación en Innovación Docente de la UNED.
- Espinosa, M. M., Núñez, G., & Domínguez, M. (1999). Integración de contenidos multimedia y sistemas de autoevaluación en un proyecto de aula virtual en expresión gráfica en la ingeniería. II Congreso Iberoamericano Expresión Gráfica. Salta. República Argentina, I, 77-82.
- Iserte, E. G., Espinosa, M. del M., & Domínguez, M. (2012). Métodos y metodologías en el ámbito del diseño industrial. *Técnica Industrial*, 300, 38-46.
- Martin-Erro, A., Domínguez, M., & Espinosa, M. M. (2016). New computer-aided design tools applied on engineering design education. *Ingeniería Educativa*, 10, 11–14.
- Prádanos, R., Sanz, J. M., González, J., Escudero, L. E., Sola, R., Hernández, L., ... Sola, J. I. (2009). Prácticas interactivas de dibujo técnico. XXI Congreso Internacional de Ingeniería Gráfica, 9.
- Romero, L., Domínguez, I. A., Espinosa, M. D. M., & Domínguez, M. (2015). Team Work Aptitude Development in the Field of Concurrent Engineering through ICT Tools: Collaborative Engineering. *International Journal of Engineering Education*, 31(1-B), 292-301.

- Romero, L., Romero, M., Jiménez, M., Espinosa, M. del M., & Dominguez, M. (2015). Analysis of university success depending on the infrastructure of the university and the student's degree preparation in their access. Proceedings of INTED2015 Conference, 0968-0974.
- Salido, M., Bernal, C., & Domínguez, M. (2002). La innovación tecnológica en la enseñanza a distancia del dibujo técnico por ordenador. *Informática Educativa. Tecnologías de la información y la comunicación para el aprendizaje*, ISBN: 84-699-8711-9/84-699-8712-7, 8.
- Vallecillo, R., Prádanos, R., Núñez, G., Romero, L., Domínguez, M., & Espinosa, M. M. (2018a, noviembre). Training deficiencies in secondary school: Causes of demotivation and premature abandonment of university students. 9070-9079. <https://doi.org/10.21125/iceri.2018.0677>
- Vallecillo, R., Prádanos, R., Núñez, G., Romero, L., Domínguez, M., & Espinosa, M. M. (2018b). Utilización de TIC en un curso 0 de dibujo técnico, pilar fundamental en la formación del futuro ingeniero. CUJAE. *Memorias del 19CCIA*, 12.

## Virtual classroom use in short learning courses: An exploratory study

Iwan Wopereis

Open University of the Netherlands, the Netherlands  
iwan.wopereis@ou.nl

Kees Pannekeet

Open University of the Netherlands, the Netherlands  
kees.pannekeet@ou.nl

Tom Melai

Open University of the Netherlands, the Netherlands  
tom.melai@ou.nl

### Abstract

Contemporary virtual classroom (VC) systems are promising tools for teaching in online and blended learning programs. They offer practicable means to facilitate complex learning and (academic) enculturation. This study evaluates a free-of-charge short learning course (called 'micro module') for (aspirant) teachers and educationalists that introduces and promotes VC-use in present-day educational settings. Central to this short course were four one-hour VC-sessions that addressed (a) utility and usability issues and (b) topics related to (complex) learning and teaching in VC-environments. The sessions were distributed over a one-week period; each day both an afternoon and an evening version of a session were organized. Approximately 280 persons signed-up for the program. Between 5 and 10 percent of these subscribers took part in one or more VC-sessions. The recordings of the sessions were viewed around 160 times in total (count one month after the program ended). Relatively low numbers of participation and recording views question the return of investment of delivering a VC-rich short learning course. However, those participants who took part in the VC-sessions highly valued its content and structure ( $M=7.9$ ;  $Mdn=8$ ;  $Mode=9$ ; ten-point scale). Especially the hands-on VC-experience was appreciated. Results further show that organizing non-compulsory VC-sessions at fixed moments leads to a low turnout in these sessions. High quality content doesn't seem to affect that. Additional research is necessary to confirm these findings.

**Keywords:** online learning, synchronous online learning, virtual classroom, short learning program.

### 1. Introduction

Interest in synchronous online learning grows rapidly. We define synchronous online learning (SOL) as an educational learning situation that features a "permanent separation (of place) of the learner and instructor during planned learning events where instruction occurs in real time such that students are able to communicate with other students and the instructor through text-, audio-, and/or video-based communication of two-way media that facilitates dialogue and interaction" (Martin, Ahlgrim-Delzell, & Budhrani, 2017, p. 5). Both in regular educational settings (where in person teaching and learning is the norm) and in distance learning programs (that mainly include asynchronous interaction), teachers and students increasingly adhere to web-based technologies that facilitate such learning (Martin et al., 2017; Sun, Liu, Luo, Wu, & Shi, 2017). Not only the 'technology push' is responsible for this increase, but also the growing awareness among teachers and educationalists that synchronous interaction (i.e., student-student, student-teacher and student-content) is of great importance in learning (Chen, Wang, Kirschner, & Tsai, 2018; De Hei, Strijbos, Sjoer, & Admiraal,



2016; Ertl, Fisher, & Mandl, 2007). Until recently, synchronous interaction in education was limited to live events where people meet in person (i.e., classroom sessions, meetings) or (conference) phone calls. However, proliferating internet technology ensures that synchronous communication via digital text (chat), audio (audio conferencing), video (video conferencing) and combined (multimedia, visual avatars, web conferencing) is now within reach of most teachers in distance and regular education. New digital technologies make complex online interaction possible and therefore offer ample opportunities to create online learning environments that facilitate cooperative and collaborative learning (Green, 2016; Kreijns, Kirschner, & Jochems, 2003). Hrastinski (2008) argues that synchronous communication allows for learning with a personal touch: it helps to increase arousal, motivation, and convergence on meaning in educational activities. In addition, it facilitates commitment to group learning and (academic) enculturation. As such, synchronous communication is a crucial constituent in the development of (online) learning communities (De Hei et al., 2016; Kreijns et al., 2003).

An important contemporary online instrument that combines several modes of synchronous communication is the virtual classroom (VC). The VC fits the aforementioned definition of SOL (Martin & Parker, 2014). The instrument enables two-way communication between students and teachers so that different forms of instruction can be provided. Christopher (2015) mentions eight key features of a VC: (a) content sharing, (b) screen sharing, (c) audio, (d) chat, (e) drawing and pointer tools, (f) polls, (g) instant feedback, and (h) breakout rooms. These functionalities provide for interaction, but above all make clear that the VC is a multimedia tool that needs to be used with care (Clark & Mayer, 2016). Otherwise, there is a risk of cognitive overload for both the learner and the instructor during a session. Such load may hamper learning as well as teaching. It may be obvious that knowledge and skill in designing, developing, and delivering a VC-session is an absolute necessity in order to actually run one.

At the Open University of the Netherlands (OUNL), teachers regularly provide VC-sessions. Depending on the learning goals that are central to a VC-session, instruction in sessions may include expository forms of direct instruction (Blanche, 2019) or inquisitory types of collaborate learning techniques (Barkley, Major, & Cross, 2014). Since the OUNL implemented a new educational model that prescribes that students should study in cohorts (Schlusmans, Van den Munckhof, & Nielissen, 2016), the latter type of instructional methods is receiving increasing attention in the professionalization of teachers at the OUNL. More insight in the effectiveness of cooperative and collaborative learning (Barkley et al., 2014; Johnson & Johnson, 2009) and skill in using computer-supported collaborative learning techniques is essential to fuel the SOL-trend in online and blended forms of education (cf. Hrastinski, 2008, 2019).

This paper presents experiences of the OUNL with the use of the VC in its institution. The focus is on an initiative that aimed at disseminating knowledge about online learning gained at the OUNL over the years (see Wopereis, Pannekeet, Melai, Schlusmans, Van den Munckhof, & Moerkerke, 2019). This initiative included a series of six short learning units, called 'micro modules', that addressed didactical, technological, and managerial issues related to designing, developing, and implementing online education. In this paper, we specifically turn to the fourth module called 'The Virtual Classroom' that aimed at gaining the participants knowledge on the VC-instrument and getting acquainted with its use. Participants learned knowledge on VC-technology and didactics by means of instruction in the VC. We chose this hands-on approach, because there is no better way to learn about a VC than to experience one (cf. Merrill, 2002; Schank, Berman, & McPherson, 1999).

The micro module had to fit a specific course format and study load could not exceed four hours (Wopereis et al., 2019). These restrictions meant that the focus couldn't be on complex skill learning or competence

development (e.g., learning the complex skill to design and deliver a VC-session for higher education students; Van Merriënboer & Kirschner, 2018). Therefore, we decided to focus on knowledge acquisition (i.e., VC-features, VC-technology, and VC-didactics) and organize hand-on experiences. Example-based learning (Van Gog & Rummel, 2010) was the premise of our micro module. This means that studying worked-out examples (which are product-oriented) and modelling examples (which aim at learning systematic approaches to problem solving) are at heart of the instruction. In this micro module, we presented such information through a video-recorded expert interview.

The aim of this study was to gain knowledge on VC-use in open online small learning courses (e.g., our micro modules). Although there is literature available on the overall quality of short open learning courses, like massive open online courses (MOOCs; Magaryan, Bianco, & Littlejohn, 2015), less is known about the quality of constituents of such courses that require synchronous communication. These constituents, such as online chat and VC-based Q&A-sessions, are often optional course features and therefore not mentioned in evaluations. Our exploratory study addresses this issue and specifically focus on the value of SOL in short learning initiatives.

The study was guided by the following research questions: (a) how do participants behave in small-scale open online courses where VC-sessions form the backbone of an educational unit, and (b) how do they value such VC-centred course.

## **2. Method**

We studied the micro module (i.e., the product of our instructional systems design [ISD] activities) and its use by means of a small-scale evaluation. The study can be classified as an exploratory case study (Yin, 2014).

### **Participants**

The participants in this study were educationalists, teachers, and students enrolled in the micro module 'The Virtual Classroom'. At the start of the micro module (March 18, 2019) about 140 persons had registered for this short learning course. This number increased to 283 during the module. A subset of the participants attended the live VC-sessions (VC-1: n=27; VC-2: n=14; VC-3: n=16; VC-4: n=12; see Table 1). These participants provided most data for this study.

### **Materials**

The materials relevant for this study included (a) the micro module on VC, (b) the VC-sessions that were central to the module, and (c) the online course evaluation form.

### **Micro module**

The micro module 'The Virtual Classroom' was the fourth module in a series of six modules on online education. The other five micro modules discussed (a) online education as a whole (general introduction), (b) activating in online education (ISD and didactics), (c) virtual reality in online education, (d) assessment in online education, and (e) research on online education (see Wopereis et al., 2019). All micro modules were delivered to the participants via yOUlearn, the course management system of the OUNL (Hermans, Kalz, & Koper, 2014; Vogten & Koper, 2018). The ISD-teams used specific design templates to ensure uniformity in the presentation of content. Each module lasted for two weeks. Study load was two to four hours. Participants could attend micro modules at their own pace. However, guidance and feedback was provided during the first two weeks only. Active online learning was central to all modules, meaning that participants could participate in both asynchronous (e.g., discussion forum) and synchronous (e.g., chat and VC) learning tasks. In yOUlearn participants could make use of a discussion forum for general questions and remarks and an 'after session

chat' for content discussions. Central to the micro module were four VC-sessions entitled (a) the Virtual Classroom (What is a VC?), (b) Learning and Teaching in the Virtual Classroom (How to design, develop, and deliver a VC?), (c) Complex Learning in the Virtual Classroom (How to design, develop, and deliver a VC for complex learning?), and (d) Future Developments. Each session was introduced in yOULearn. Figure 1 shows a screenshot of the welcome page of the micro module. The structure of the course is presented in the left margin.



Figure 1: Graphical user interface of the micro module.

The four sessions were preceded by a general introduction on the content and structure of the course. Each learning task that included a live VC-session had a similar format. First, we activated prior knowledge by means of a small assignment. Second, we presented some theory on the subject. Third, some technical and procedural information related to attending a VC-session was provided to the participants and subsequently the actual VC-session took place. Four, an 'after session chat' was organized where participants could ask additional questions. After the last VC-session, we offered additional food for thought (i.e., references to literature) and kindly asked the participants to fill in an online evaluation form.

### **Virtual classroom sessions**

The backbone of the micro module were four one-hour VC-sessions. We provided participants information in yOULearn on how to successfully attend a VC-session (e.g., technical support on how to use Collaborate Ultra, the VC-software used). Active online learning was the guiding principle for the instruction offered in each session (cf. Wopereis et al., 2019). Although we were not sure how many participants would actually participate in the sessions, we decided to implement complex collaborative learning techniques (CoLTs; Barkley et al., 2014). We applied the 'three-step interview' technique in the first session where participants introduced themselves and learned general knowledge about VCs and VC-use. In the second session on learning and teaching in the VC, we implemented the classical working group (participants had to create a global blueprint for instruction). The third session on complex learning included an assignment where the 'fishbowl technique' was applied (i.e., a small group of participants solves a problem [inner circle]; other participants [outer circle] 'observe' the problem-solving process and discuss it in the chat). The fourth session

contained a two-step discussion on the future of VC-use in education (i.e., small-group discussion first, whole-group discussion second). To provide flexibility, each session was offered twice a day to the participants (i.e., an afternoon session and an evening session; on Friday an early afternoon session and a late afternoon session). Participants could attend an 'after session chat' in yOULearn after each VC-session. Two OUNL educationalists/lecturers moderated both the VC-sessions and the 'after session chats'. Participants who could not attend a live VC-session could playback one or more recording of the session and reread the VC-chat contributions.

### Evaluation form

We developed an online evaluation form that was part of the educational content in yOULearn. It included a question on the perceived quality of the micro module (scale 1 tot 10) and open questions to record information on strengths and weaknesses of the course.

### Procedure

After the fourth VC-session, participants were asked to fill in the online evaluation form. The data of the 'after session chat' sessions were recorded in Word. All the data were anonymized before they were analyzed. We analyzed data in SPSS (perceived quality) and thematically 'by hand' (open questions and chat data) in Word and Excel. Participants who did not attend the live sessions and only watched the VC-recordings could also fill in the online evaluation form. These data have been included in the analysis.

### 3. Results

Two hundred and eighty-three educational professionals and students (eventually) registered for the micro module, but not all of them entered a live VC-session. Each session had between 12 and 27 participants. If we focus on each version of a session (each session was offered twice a day), the results show that between 4 and 15 participants attended one of the variants. Table 1 presents the participation in sessions. If we take the overall enrolment into account, this means that a low percentage of registered participants entered (one or more) VC-sessions. Two comments on the evaluation form addressed this issue. The participants who wrote these comments were disappointed that so few people took part in the sessions.

Table 1: Participation

VC Session	Time	Participants			Playback recordings			
		Learners	Teachers	Total	R1	R2	R3	Total
1. Introduction (VC 101) March 26, 2019	14:30 – 15:30	15	2	17	28	12	-	40
	19:30 – 20:30	12	2	14	6	8	-	14
Total 1		27	4	31	34	20	-	54
2. Learning and teaching March 27, 2019	14:30 – 15:30	7	2	9	4	10	-	14
	19:30 – 20:30	7	2	9	-	-	-	-
Total 2		14	4	18	4	10	-	14
3- Complex learning March 28, 2019	14:30 – 15:30	5	2	7	3	7	-	10
	19:30 – 20:30	11	1	12	12	24	-	36
Total 3		16	3	19	15	31	-	46
4. Future developments March 28, 2019	13:30 – 14:30	8	2	10	11	12	20	43
	15:30 – 16:30	4	2	6	-	-	-	-
Total 4		12	4	16	11	12	20	43

Note: each session was performed twice a day; R1=first recording; R2=second recording; R3=third recording

We deliberately offered each day two version of a session. By doing this, we hoped to that those who had registered for the micro module had sufficient opportunity to attend a session. We also recorded sessions. In

all sessions, participants were assigned to small-groups that performed tasks in so-called breakout rooms. Interaction in the breakout rooms was not recorded. Only the instruction and feedback in the 'main room' in the VC were recorded. This is the reason that more than one recording for each session exists (see R1, R2, and R3 in Table 1; R=recording). Recordings were viewed 157 times (VC-1: n=54; VC-2: n=14; VC-3: n=46; VC-4: n=43). It should be noted that the second version of VC-2 and VC-4 were not recorded and that most sessions had only two recordings (see hyphens in Table 1). Based on the comments that have been logged in the evaluation forms and the 'after session chat' we know that some VC-participants viewed the recordings of the sessions they attended. However, we assume that most views can be attributed to registered participants who could not attend the live VC-sessions.

Twenty-three participants filled in the online evaluation form. They valued the quality of the micro module and responded to the open questions. Participants were positive about the module. They rated it on average 7.9 ( $SD=1.93$ ;  $Mdn=8$ ). The distribution of the scores was left-skewed ( $-2.3$ ), which means that the mean and median were left to the peak (see Figure 2). The mode was 9.

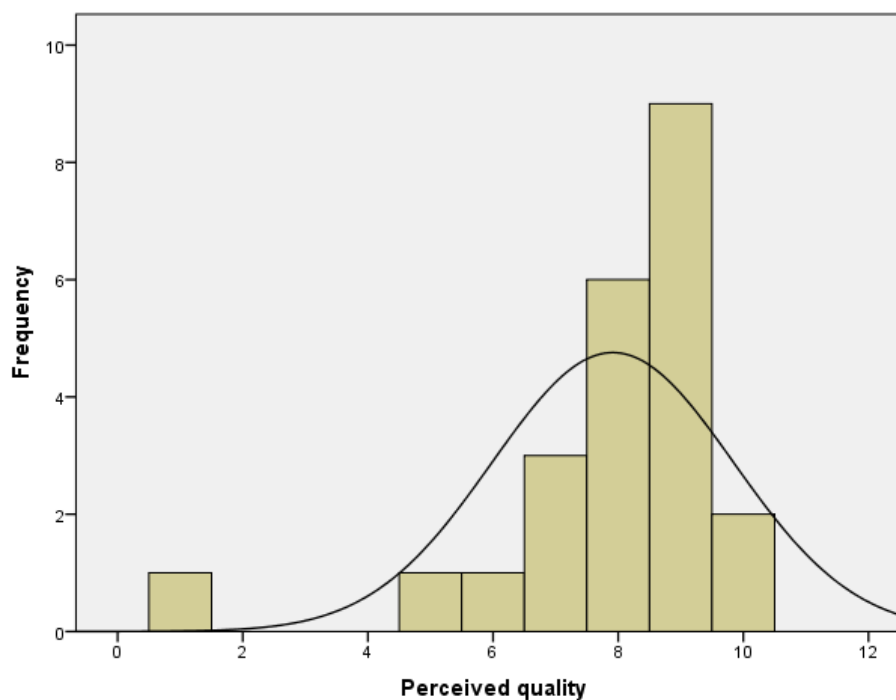


Figure 2: Frequency distribution of participants' perceived course quality

The open questions yielded 47 responses. Twenty were categorized as strengths, 17 as weaknesses, and 10 as 'neutral'. Eleven of the 20 strengths were related to the hands-on experience in the VC-sessions. Participants were positive about getting the opportunity to learn about the VC as a tool for (complex) learning and teaching. Four strengths appreciated the didactical approach in the sessions (e.g., active learning in group) and two stressed comprehensiveness. Weaknesses were related to recordings (e.g., where to find them), low attendance rate, scheduling of the sessions, and didactical approach (e.g., parts of sessions resemble a tutorial; webinar). The results of the analysis of the 'after session chat' show that this course feature was not popular. There was only some activity in four out of eight chat sessions. Nine participants joined one of these four

sessions (VC-1-afternoon: n=3; VC-1-evening: n=3; VC-2-evening: n=2; VC-4-afternoon: n=1). Topics in these sessions addressed (a) technical problems (e.g., sound), (b) ideal teacher-student ratio in VC-sessions, and (c) a word of thanks to the moderators/lecturers.

#### 4. Discussion

The aim of this exploratory case study was to gain knowledge on VC-use in open online small learning courses. The case at hand was a micro module on VC-use that was part of a series on online learning (Wopereis et al., 2019). We specifically looked at participants' behavior (i.e., participation) and perceived course quality. When we consider participation, we notice a difference between the number of registered participants and the participation in the live sessions. Between 5 and 10 percent of the micro module's subscribers actually took part in one or more VC-sessions. Scheduling of the sessions was mentioned twice in the evaluation as reason not to attend. Besides the scheduling, we think that many registered participants just wanted to *know* more on the subject of VC instead of actually *experiencing* a VC. For them the theory that was presented in yOULearn was probably sufficient to meet their goals. Additional research should reveal if this is the case. A gap between enrollment in online programs and active participation in non-obligatory SOL-activities is not new. For instance, at the OUNL we experience this phenomenon in courses where students can attend optional VC-group sessions. Often the participation rates in these sessions are relatively low. A recent observation of an OUNL MOOC on Big Data confirms this. In this course, 70 of the 900 registered participants attended a VC-mediated Q&A-session. There seems to be a '10-percent participation rule' for VC-sessions in short open SOL-centered courses, that is, about 10 percent of registered participants actually attends optional VC-sessions. The numbers of participants in VC-sessions in open short courses will probably increase when VC-sessions are obligatory (i.e., necessary for certification and/or achieving learning objectives). Future research on the funnel of SOL-participation should address this issue (cf. Clow, 2013, Magaryan et al., 2015). An interesting feature of a VC is the possibility to record a session so that it can be reviewed. Recordings of VC-sessions in the micro module were viewed 157 times. This number would probably be higher if participants were notified when a recording was available. Now, participants had to find the overview of links to recordings in yOULearn themselves. Remarks of participants on the evaluation form made clear that this was not as obvious as expected.

Our limited view on participation in this study makes clear that more observational research is needed. We suggest that additional research on participants' behavior in open SOL-centered courses should focus on the actual behavior of participants in the course environment and in the VC-session. Analyzing navigation data in yOULearn and video recordings of VC-sessions might be an interesting next step. Especially the observation of participation in VC-sessions would be of interest. Then we can for instance learn more about the reasons of a small portion of participants that decided to leave a session when the instructor explained that group work was central to that session. These participants probably just wanted to 'lurk' and not actively participate in activities. Additional interviews can be used to validate findings.

If we consider the quality of the micro module, we can conclude that this instructional format is promising. Participants gave high ratings and reactions in the evaluation were mainly positive. Especially the hands-on experience in the VC and the didactical approach (i.e., example-based learning) were valued. Based on this, we think that the micro module is an ideal stepping-stone to the development of a short learning program (SLP; Thaler & Bastiaens, 2017). A more comprehensive SLP could address the issue of fully learning the complex skill of designing, developing, and delivering VC-sessions. Learning (and instructing) complex skills requires far more time and effort than a micro module can offer. In order to learn a complex skill, participants should have the opportunity to activate prior knowledge related to the skill, observe demonstrations of the skill in question, apply new knowledge on the skill, integrate this new knowledge with existing knowledge, and do all this in a



task-centered instructional setting where authentic tasks are the foundation for the instruction (Merrill, 2002; Van Merriënboer & Kirschner, 2018; Wopereis, Frèrejean, & Brand-Gruwel, 2015, 2016). In order to increase instructional effectivity, efficiency, and engagement (Ebner & Gegenfurtner, 2019; Keller, 2008; Merrill, 2002), stakeholders such as teachers, VC-moderators, and aspiring participants, should all be included in a process of instructional co-creation (Moerkerke, 2015) that follows an agile-like ISD approach (Adnan & Ritzhaupt, 2018; Allen, 2017).

## 5. References

- Adnan, N. H., & Ritzhaupt, A. D. (2018). Software engineering design principles applied to instructional design: What can we learn from our sister discipline? *TechTrends*, *62*, 77-94. doi:10.1007/s11528-017-0238-5
- Allen, M. W. (2017). The Successive Approximation Model (SAM): A closer look. In R. A. Reiser & J. V. Dempsey (Eds.), *Trends and issues in instructional design and technology* (4th ed., pp. 42-51). Upper Saddle River, NJ: Pearson.
- Barkley, E. F., Major, C. H., & Cross, K. P. (2014). *Collaborate learning techniques: A handbook for college faculty* (2nd ed.). San Francisco, CA: Jossey-Bass.
- Blaine, A. M. (2019). Interaction and presence in the virtual classroom: An analysis of the perceptions of students and teachers in online and blended Advanced Placement courses. *Computers & Education*, *132*, 31–43. doi:10.1016/j.compedu.2019.01.004
- Chen, J., Wang, M., Kirschner, P. A., & Tsai, C.-C. (2018). The role of collaboration, computer use, learning environments, and supporting strategies in CSCL: A meta-analysis. *Review of Educational Research*, *88*, 799-843. doi:10.3102/0034654318791584
- Christopher, D. (2015). *The successful virtual classroom: How to design and facilitate interactive and engaging live online learning*. New York, NY: AMACOM / American Management Association.
- Clark, R. V., & Mayer, R. E. (2016). *E-learning and the science of instruction: Proven guidelines for consumers and designers of multimedia learning* (4th ed.). Hoboken, NJ: Wiley.
- De Hei, M., Strijbos, J.-W., Sjoer, E., & Admiraal, W. (2016). Thematic review of approaches to design group learning activities in higher education: The development of a comprehensive framework. *Educational Research Review*, *18*, 33-45. doi:10.1016/j.edurev.2016.01.001
- Ebner, C., & Gegenfurtner, A. (2019). Learning and satisfaction in webinar, online, and face-to-face instruction: A meta-analysis. *Frontiers in Education*, *4*:92. doi:10.3389/educ.2019.00092
- Ertl, B., Fischer, F., & Mandl, H. (2006). Conceptual and socio-cognitive support for collaborative learning in videoconferencing environments. *Computers & Education*, *47*, 298-315. doi:10.1016/j.compedu.2004.11.001
- Green, P. (2016). How to succeed with online learning. In N. Rushby & D. W. Surry (Eds.), *The Wiley handbook of learning technology* (pp. 261-286). Chichester, UK: Wiley.
- Hermans, H., Kalz, M., & Koper, R. (2014). Toward a learner-centered system for adult learning. *Campus-Wide Information Systems*, *31*, 2-13. doi:10.1108/CWIS-07-2013-0029



- Hrastinski, S. (2008). Asynchronous and synchronous e-learning: A study of asynchronous and synchronous e-learning methods discovered that each supports different purposes. *EDUCAUSE Quarterly*, 31(4), 51–55. retrieved from <https://er.educause.edu>
- Hrastinski, S. (2019). What do we mean by blended learning? *TechTrends*, 63, 564-569. doi:10.1007/s11528-019-00375-5
- Johnson, D. W., & Johnson, R. T. (2009). An educational psychology success story: Social Interdependence theory and cooperative learning. *Educational Researcher*, 38, 365–379. doi:10.3102/0013189X09339057
- Keller, J. M. (2008). First principles of motivation to learn and e3-learning. *Distance Education*, 29, 175-185. doi:10.1080/01587910802154970
- Koper, R. (2014). Towards a more effective model for distance education. *eLeed*, 10. Retrieved from <http://elead.campussource.de/archive/10/4010>
- Kreijns, K., Kirschner, P. A., & Jochems, W. (2003). Identifying the pitfalls for social interaction in computer-supported collaborative learning environments: a review of the research. *Computers in Human Behavior*, 19, 335-353. doi:10.1016/S0747-5632(02)00057-2
- Magaryan, A., Bianco, M., & Littlejohn, A. (2015). Instructional quality of massive open online courses (MOOCs). *Computers & Education*, 80, 77-83. doi:10.1016/j.compedu.2014.08.005
- Martin, F., Ahlgrim-Delzell, L., & Budhrani, K. (2017). Systematic review of two decades (1995-2014) of research on synchronous online learning. *American Journal of Distance Education*, 31, 3-19. doi:10.1080/08923647.2017.1264807
- Martin, F., & Parker, M. A. (2014). Use of synchronous virtual classrooms: Why, who, and how? *Journal of Online Learning and Teaching*, 10, 192-210. Retrieved from <http://jolt.merlot.org>
- Merrill, M. D. (2002). First principles of instruction. *Educational Technology Research and Development*, 50(3), 43-59. doi:10.1007/BF02505024
- Moerkerke, G. (2015). Modern customers and open universities: Can open universities develop a course model in which students become the co-creators of value? *Open Learning: The Journal of Open, Distance and e-Learning*, 30, 235-251. doi:10.1080/02680513.2015.1117969
- Schank, R. C., Berman, T. R., & Macpherson, K. A. (1999). Learning by doing. In C. M. Reigeluth (Ed.), *Instructional design theories and models: A new paradigm of instructional theory* (Vol. II) (pp. 161–181). Mahwah, NJ: Lawrence Erlbaum Associates.
- Schlusmans, K., Van den Munckhof, R., & Nielissen, G. (2016). Active online education: A new educational approach at the Open Universiteit of the Netherlands. In G. Ubachs & L. Konings (Eds.), *Proceedings of the Online, Open and Flexible Higher Education Conference* (pp. 163-176). Maastricht, the Netherlands: European Association of Distance Teaching Universities.
- Sun, Z., Liu, R., Luo, L, Wu, M., & Shi, C. (2017). Exploring collaborative learning effect in blended learning environments. *Journal of Computer Assisted Learning*, 33, 575-587. doi:10.1111/jcal.12201

- Thaler, I., & Bastiaens, T. (2017). *EADTU task force short learning programs: Final report*. Maastricht, the Netherlands: Maastricht, the Netherlands: European Association of Distance Teaching Universities. Retrieved from <https://eadtu.eu>
- Van Gog, T., & Rummel, N. (2010). Example-based learning: Integrating cognitive and social cognitive research perspectives. *Educational Psychology Review*, 22, 155-174. doi:10.1007/s10648-010-9134-7
- Van Merriënboer, J. J. G., & Kirschner, P. A. (2018). *Ten steps to complex learning: A systematic approach to four-component instructional design* (3rd ed.). New York, NY: Routledge.
- Vogten, H., & Koper, R. (2018). Towards big data in education: The case at the Open University of the Netherlands. In J. Spector et al. (Eds.), *Frontiers of cyberlearning: Emerging technologies for teaching and learning* (pp. 125-143). Singapore: Springer.
- Wopereis, I., Frèrejean, J., & Brand-Gruwel, S. (2015). Information problem solving instruction in higher education: A case study on instructional design. *Communications in Computer and Information Science*, 552, 293-302. doi:10.1007/978-3-319-28197-1\_30
- Wopereis, I., Frèrejean, J., & Brand-Gruwel, S. (2016). Teacher perspectives on whole-task information literacy instruction. *Communications in Computer and Information Science*, 676, 678-687. doi:10.1007/978-3-319-52162-6\_66
- Wopereis, I., Pannekeet, K., Melai, T., Schlusmans, K., Van den Munckhof, R., & Moerkerke, G. (2019, October). *Towards a short learning program on online learning at the Open University of the Netherlands*. Paper presented at the Online, Open and Flexible Higher Education Conference, Madrid, Spain.
- Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.

## Visual Tools focused on creativity and collaborative work in a blended learning university

### Rodrigo Martín García

UNED, Spain  
rmarting@cee.uned.es

### Raquel Arguedas Sanz

UNED, Spain  
rarguedas@cee.uned.es

### Carmen López Martín

UNED, Spain  
carmen.lopez@cee.uned.es

### Abstract

Employer demand for creative, teamwork-gearred professionals requires a straightforward response from educational institutions. In this contribution, a pilot programme on blended learning teaching methodology is described. It was conducted with undergraduates enrolled in business administration (BA) or economics at Spain's National Distance University (UNED). The main contributions revolve around: 1) the demographic (age, sex), sociological (profession, education) and psychographic diversity of the group studied; 2) the research design, which combines blended mentoring with the creation of a knowledge community of both educators and learners and a working approach in which simultaneous role playing affords exercises a dual (author and user) folksonomy. This leads to: a) spur the development of creativity and collaboration in a learning oriented community through visual tools; b) identify learning analytics patterns that would support academic and institutional decision-making with a view to training professionals along employer-demanded lines. Course, discipline and university scale policy proposals are put forward that would be applicable as well to other institutions with analogous objectives, methods or student profiles. The first step is underway: a meta-search engine based on the metadata available that enables students to conduct intelligent searches, sharing contents and assessing peer contributions.

**Keywords:** educational collaborative networks (ECNs), collaborative learning, blended learning, creativity, visual thinking, employability, learning analytics.

### 1. Introduction

Encouraging creativity is essential and should be furthered across the whole education system. Patmore et al. (2009) contended that creativity adopts two forms: a) visual thinking, to grasp and conceptualise a situation globally; and 2) problem solving, a skill focused on by the education system on the whole and business schools in particular (Hammond, 1980; Mintzberg, 2004; Datar et al., 2010; Ferlie et al., 2010; Anteby, 2013). In contrast, although characteristic of creative managers (Armstrong and Page, 2015), visual thinking is a talent accorded less importance in education. As a result, visual tools are not always familiar to students, whose understanding and use of which is limited to special projects in very specific courses (Bridgman et al., 2016).

The ability to work effectively with others, in turn, is a skill commonly and constantly called for by employers (McMurray et al., 2016; Riebe et al., 2017), so universities and business schools must encourage creativity and teamwork to afford graduates some of the aptitudes in greatest corporate demand. With a view to addressing these problems, the National Distance University (UNED), delivers long-term lifelong learning for students in Spain and abroad further to a blended learning model. The aim is to deploy the most widely used visual tools in a context of professor and student partnering by creating a knowledge community where all the members are both creators and users of the visual content associated initially with one and in future with several courses on the curriculum.

The study's main contributions to the literature revolve around: 1) blended learning teaching methodology; 2) the demographic (age, sex), sociological (profession, education) and psychographic diversity of the group studied; 3) the research design, which combines blended mentoring with the creation of a knowledge community of both educators and learners and a working approach in which simultaneous role playing affords exercises a dual (author and user) folksonomy (a series of terms used to describe the content of a web document or resource for social labelling in the context of the social web).

The rest of this paper is structured as follows: section 2 reviews the literature relevant to this research. The description of fieldwork and information processing methodology in section 3 is followed by a discussion of the findings in section 4 and the conclusions in section 5.

## 2. Review of the literature

Representing ideas, concepts, mechanisms or relationships with visual tools fuels metacognition, the thought processes involved in organising content knowledge into patterns and solving situations and problems (Hyerle, 1996). That involves using a different language to: 1) represent cognitive patterns that integrate prior experience and content knowledge; 2) build abstract concepts; and 3) integrate conceits from different disciplines (Hyerle, 2008). According to Antón et al. (2016), it entails introducing new means for acquiring knowledge and furthering 'pluri-languages', which the author contends yield better academic results and greater satisfaction than conventional educational resources (summaries, synoptic charts) (Martín et al, 2018).

A non-exhaustive list of the wide variety of visual tools might include infographics, mind maps, concept maps, webbing, word clouds, sketchnoting, visual notes, graphic jams, empathy maps and manual thinking. Hyerle (2008) classified these visual tools into three groups that help develop metacognition: brainstorming webs, task-specific graphic organisers and thinking process maps. (see Table 1).

Table 1. Types of visual tools

<b>Brainstorming webs</b>	<b>Task-specific graphics organisers</b>	<b>Thinking process maps</b>
Webbing	Storyboards	Concept mapping
Mind mapping	Time lines	System diagrams
Clustering	Problem solving	Thinking maps

Source: Hyerle (2008).

This project applied three of the visual tools listed in Table 1 (mind mapping, concept mapping and webbing), based on the ease with which they could be initially introduced and the type of content to which they would be applied. To encourage creativity, students were invited to freely choose any of these tools or others within their reach.

Mind mapping was developed by Buzan (2006) to represent ideas with images (concepts) based on a central idea to enable users to grasp non-linear relationships and associations. It stimulates visual perception, memory and creativity; stokes learning; displays connections between ideas; encourages collective thinking; improves teams' analytical capacity; and constitutes a problem-solving tool (Buzan, 2006; Buzan and Griffiths, 2014). University students find mind maps particularly valuable, for the association between new and prior information fosters cognitive development (Zipp et al., 2015). The literature contains descriptions of the use of visual tools in universities (Somers et al., 2014; Beel, 2017; Franklin et al., 2015).

Concept mapping is used to visually display hierarchically inter-related ideas or concepts. Developed by Novak (1977) in the nineteen seventies, it is especially useful in scientific training and practice (Novak, 1990; Novak, 1991; Novak and Cañas, 2006). Papers by Colosimo and Fitzgibbons (2012), Tseng et al. (2013) and Schwendimann (2015) discuss the benefits of this tool in science, technology, engineering and mathematics courses.

Webbing, also known as bubble maps, is a technique for relating or connecting topics, ideas or concepts using bubbles and lines. Described by Ayed et al. (2014) and Hyerle (2008), it renders some of the characteristics of the preceding techniques more flexible.

Visual thinking techniques –that cover a wide spectrum of procedures, methods and techniques designed to facilitate understanding and communicate ideas through drawings, graphs, schemes and similar visual resources– are acquiring growing significance as tools for structured and organised access to complex information to facilitate learning, are particularly useful in collaborative contexts. Hence the increasing importance of knowledge communities and social networks (Serrano and da Cunha, 2016). As De Haro (2010) noted, knowledge communities 1) help students develop a series of skills, notably exploration, evaluation and selection of information sources; 2) establish channels for collaborating with third parties (wikis, blogs, ...); 3) drive the generation of different forms of digital products (not only descriptive texts); 4) stimulate communication for creating joint knowledge; and 5) facilitate multicultural collaboration and adaptation of educational resources (Rodrigo et al., 2013). Social networks, the technological tools most familiar to university students (Cabero and Marín, 2014) 'mutually reinforce education and the digital society, creating synergies that favour excellence in educational innovation' (Ruiz et al., 2013).

### **3. Methodology**

The initial assumptions adopted in this study, conducted in the context of the UNED's Visual Thinking-Mediated Innovation and Creativity project, were: 1) visual tools stimulate creativity and adapt learning mechanisms to mind function (Buzan, 2006); 2) students using visual thinking (VT) techniques understand financial course content more readily, further to findings by Messina et al. (2017); 3) just as students choose the learning tools best adapted to their characteristics and needs, the choice of VT tools should likewise be voluntary; 4) partnering yields good academic results, motivates students to work in groups and affords greater satisfaction than traditional individualised study. These assumptions are a necessary corollary to the project's aim to cater to each student's interests, skills and availability in a community as varied as the UNED's student body .

The main working hypothesis drawn from the foregoing is that visual tools have a positive impact on learning, perceptible both in academic results and student satisfaction after their use. Further to that hypothesis, action guidelines and results were sought in keeping with participant characteristics.

The use of VT tools by geographically disperse undergraduates with a diversity of profiles was based on three tasks:

- Each student prepared two syllabus-based exercises, one chosen by the participant and the other assigned by the teaching team (to ensure that taken together, all the exercises covered the 10 key course topics). Exercises were allocated after the participating student base was established (Activity 1).
- Each participant reviewed and, using a standard questionnaire, assessed some of their virtual classmates' exercises (at least one per each of the 10 topics on the syllabus) to grasp the relative utility of the tool and its application by the user community (Activity 2a).
- Students classified their own exercises and the ones they assessed (at least one per subject area) based on the existing taxonomy or using their own classification systems (Activity 2b).

A series of supplementary activities was undertaken to analyse the impact of visual thinking tools used by university students in a collaborative environment: VT instrumental technique- and content-related training, monitoring through teaching team and alumnus mentor videoconferencing, self-assessment and information compilation to analyse project impact on students. The activities conducted under this initiative are listed in Table 2.

Table 2. Project activity sequence

Denomination	Performed
Initial survey	At project outset
Timetable	At the beginning of the course
Visual thinking materials	After the second month
Exercise 1: own exercise using VT techniques	Every two syllabus topics
Activity 2: review, labelling and appraisal	After each syllabus topic (10 in all) further to timetable established by teaching team
Activity 3: self-assessment test	After each topic
Activity 4: videoconference sessions	After each group of topics
Activity 5: mentoring	Two online sessions+continuous monitoring
Final survey	Upon project finalisation

Three surveys (pre- and post-project and appraisal of classmates' visual exercises) were formulated to assess project impact. The pre-project survey aimed to identify the circumstances present at the outset, the interests and expectations of students who had showed an interest in participating in the project and participant characterisation. The post-project survey was designed to determine students' opinion of project *modus operandi* and course activities in terms of educational innovation, learning, fulfilment of expectations, applicability of VT techniques and perception of the course and the project. The survey on appraisal of classmates' visual exercises intended to assess user-perceived quality of the exercises, ascertain the most significant parameters for defining quality (content, technique, format...) and generate a collective user community taxonomy for the respective academic content. The questionnaires were created with Google Docs form tools around four types of questions: five-point Likert scale (with 1 meaning total disagreement and 5 total agreement with the statement), single answer (two or more alternatives) closed multiple choice, multiple answer closed multiple choice and open questions.

Project participants were enrolled in 'Investment and Financing', a third year undergraduate BA course or 'Corporate Economy: Investment and Financing', a second year undergraduate economics course, delivered

as semester courses in the first half of the 2016-17 school year at the UNED's Faculty of Economics and Management. All students participated voluntarily, were aware of the activities involved and committed to completing them within the semester.

The electronic files containing the questionnaire data were coded and the findings tabled and statistically analysed using a univariate approach, to identify students' sociological characteristics, a description of course and project appraisals and the effect of the project on their academic performance and expectations.

#### 4. Results

Just as a direct causal relationship has been researched/documentated between employee attitude, commitment and performance and company HRM (human resource management) when favourably perceived, analogous research would be welcome on the extent to which that relationship exists in the educational realm. In particular, Runhaar (2016) examined the causal relationships between HRM systems, teachers' attitudes and behaviour on the one hand and student outcomes and the achievement of a school's objectives on the other.

A first major result was the creation of a knowledge community to which all participants contributed from a dual perspective: as content generators and as users and advocates of contents formulated by others. The 105 visual exercises that constituted the first type of contributions entailed: 1) manual formulation and subsequent digitisation; 2) using general market software (MSOffice, open access processors); and 3) a command of specific visual applications (such as Xmind and Mindnode). The techniques used were the ones recommended (mind and concept mapping, webbing) in addition to sketchnoting, which while not recommended was chosen by nearly one in every three participants (Figure 1).

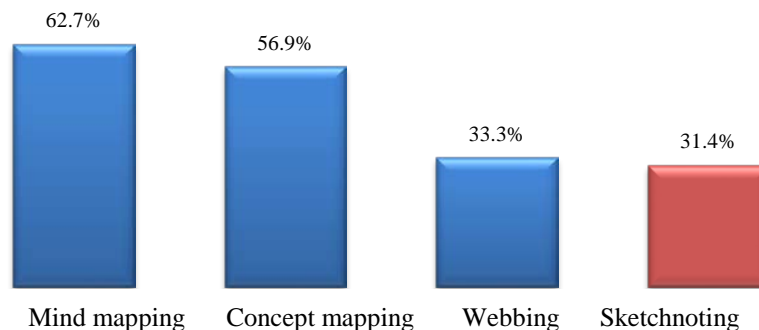


Figure 1. Use of techniques by participants (%)

The second type of contributions consisted in 610 appraisals subsequently used to label content with a view to its inclusion in a data warehouse as a collective knowledge base associated with the courses involved. Students' replies to the post-project questionnaire described above (Table 2) are analysed in this section.

A total of 82.4 % of the participants consented to the identification and labelling of their exercises for use by other students or interested parties in future editions of the project and were even more willing to share with the classmates enrolled in the same undergraduate course (84.3 %). They were less keen on sharing content on social networks, for only 58.8 % agreed to upload their exercises to Facebook, Twitter or Pinterest and 27.5 % refused to do so (Figure 2).



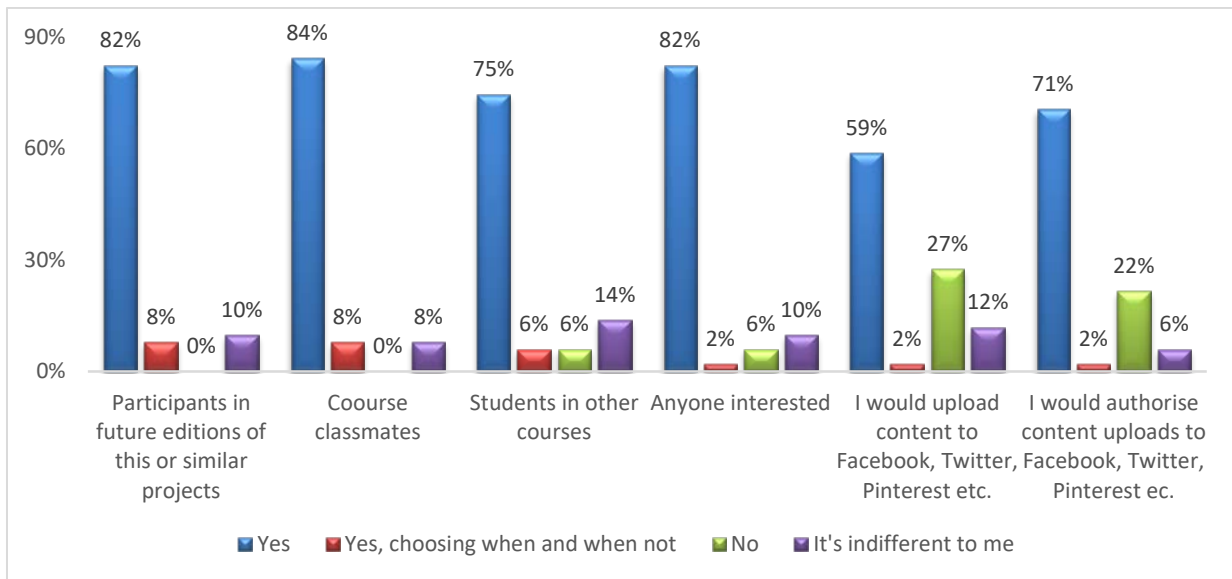


Figure 2. Vehicle for sharing exercises with future students

New users scored the future utility of visual tools very highly: 74.5 % of participants had recommended or would recommend them to others and 70.6 % were applying them in their everyday study or work routines or intended to do so soon (Figure 3).

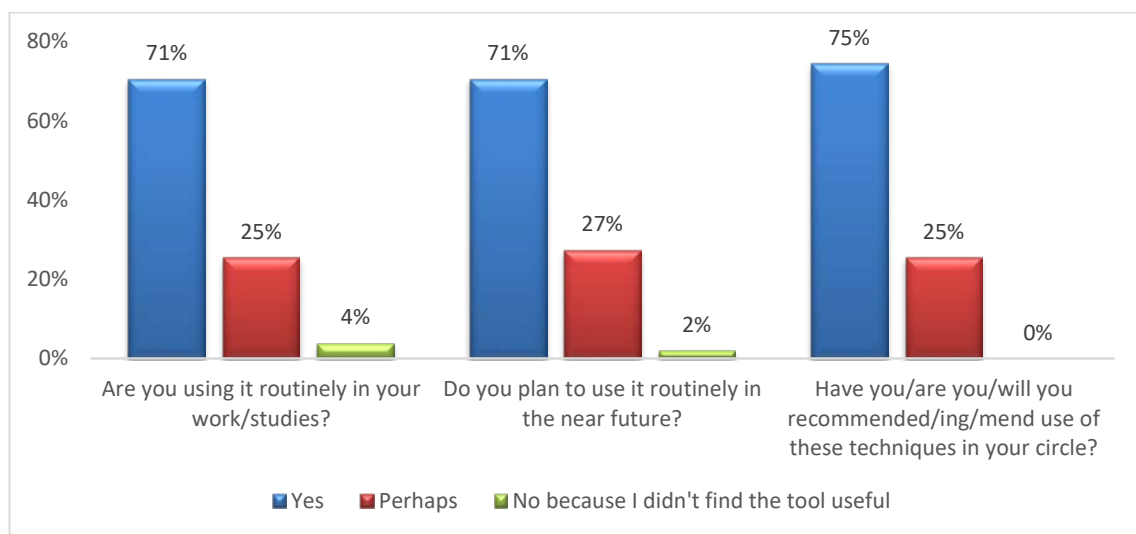


Figure 3. Use or recommended use of VT tools

The inference is that students viewed collaboration with others very positively. That positive experience will predispose them to workplace cooperation and inspire teamwork, so highly esteemed by employers. Students also had a positive opinion of VT tools that spur creativity in authors and users, with over three-quarters assimilating them in their daily routines and urging others to do so. The project contributed, then, to align the needs of potential employers to students’ skills, aptitudes and interests.

A second major finding was drawn from the analysis conducted to ascertain the factors determining the results and student satisfaction and hence facilitate decision-making around courses and the curriculum overall, as appropriate.

#### 4.1 Sociological characteristics of project participants

Of the 62 students who signed onto the project, 11 or 20 % dropped out, a rate within the normal range for the UNED's student profile. Martín et al. (2018) documented drop-out rates of over 30 % in similar projects. Table 3 gives the profiles of the 51 students who completed all the activities and answered all the questionnaires.

Table 3. Project participants' sociological characteristics

<b>Sex</b>	<b>Total</b>	<b>(%)</b>
Male	28	54.9%
Female	23	45.1%
<b>Age</b>		
35 or under	22	43.1%
Over 35	29	56.9%
<b>Degree pursued</b>		
BA	32	62.7%
Economics	19	37.3%
<b>Obligations possibly conditioning course work</b>		
Paid employment	22	43.1%
Caregiving	12	23.5%
Both	17	33.3%
<b>Paid employment</b>		
Yes	42	82.4%
No	9	17.6%
<b>Working hours</b>		
Full time	30	58.8%
Part time	12	23.5%
<b>Prior knowledge of VT</b>		
Yes	18	35.3%
No	33	64.7%
<b>Prior participation in teaching innovation project</b>		
Yes	4	7.8%
No	47	92.2%
<b>Prior university training</b>		
No	37	72.5%
Yes	14	27.5%
<b>Enrolment in BA or economics immediately after secondary school or other university courses</b>		
Yes	20	39.2%
No	31	60.8%

As Table 3 shows, UNED students are atypical in terms of age, prior training and extracurricular personal obligations. A substantial percentage (82.4 %) were employed and 100 % claimed to have occupational (43.1 %) or caregiving (23.5 %) obligations or both (33.3 %) that limited the time they could devote to study. A total of 27.45 % had earned at least one university degree prior to enrolment in BA or economics. The student profile for this community fell within the normal UNED pattern (Arguedas et al., 2018): a wide range of ages (19-71, mean=38.5), geographies and level of schooling. Just 7.8 % had participated in at least one prior teaching innovation project.

#### 4.2 Analysis of the project and its effect on academic performance in undergraduate courses

A descriptive statistical analysis of the three parts (course evaluation; project evaluation; and project impact on course works and results -academic performance and satisfaction-) of the survey is discussed below.

##### Course evaluation

The means, medians and standard deviations for the 15 five-point Likert scale items on the questionnaire on course evaluation are given in Table 4.

Table 4. Under graduate course (BA and economics) evaluation

	Mean	Median	Std dev.
I believe my pre-enrolment knowledge sufficed to take the course	4.12	4	0.82
The study guide contains clear and detailed information on course content and procedures	4.41	4	0.67
The basic ink print material on the course is clear and well suited to distance education	4.31	4	0.76
The virtual supplementary materials provided are useful for course work	4.31	4	0.68
The self-assessment activities are useful for course work	4.57	5	0.64
The virtual lessons are clearly structured and organised	4.31	4	0.88
The teaching team responds appropriately to students' queries	4.67	5	0.52
Participation in virtual lessons is useful for course work	4.39	4	0.67
The information and examples on the final mark furnished by the teaching team help prepare the final exam	4.31	4	0.79
The quarterly exams prepare the final	4.24	4	0.86
The face-to-face (final) exam provides a fair measure of my command of course content	3.80	4	0.92
I am generally satisfied with the course materials	4.49	5	0.54
I am generally satisfied with the teaching team's assistance	4.65	5	0.56
I am generally satisfied with the assessment system	3.98	4	0.99
I am generally satisfied with the training received	4.45	4	0.54

All the course features analysed were judged very highly by students. The item on teaching team response to queries posed by students scored most highly (4.67), followed by general satisfaction with teaching team assistance (4.65) and the utility of self-assessment for course work (4.57). The items on the other end of the scale were the accuracy of the final exam as a measure of students' command of the subject matter (3.8) and the overall evaluation of traditional assessment procedures (3.98). Whilst students were most critical of the assessment procedures, they scored these items much higher than the 2.5 Likert scale mid-point. In today's environment of increasingly demanding students, the challenge consists in maintaining such high satisfaction levels in future academic years.

##### Project evaluation

We verify that marks earned on the final exam for project participants' and non-participants were not equal. Participants' mean mark was (5.98) and nonparticipants' mean mark was (4.90). Student's t for the null hypothesis was 2.59 at p-value=0.012. That implies that we can reject the hypothesis of equality of means and, consequently, we can conclude that the participants' marks and non-participants' marks are not the same, what proves that students who take part in our innovation project based on collaborative visual techniques get higher marks.

Regarding the students' relationship visual tools, prior to participation in the project, 64.71 % of the students claimed to be unaware of visual tools or their application for professional or academic purposes, corroborating the initial hypothesis. That, together with the growing applicability of such tools in the business world, led to the choice of these VT techniques for the project at hand. Further to the pre- and post-project awareness of the most common visual techniques depicted in Figure 4, participants focused on the most useful techniques, disregarding others. Their command of the tools proposed (mind mapping, concept mapping and webbing) rose significantly, along with the mastery of others not proposed, sketchnoting in particular. Use of other tools initially unknown such as word clouds, visual notes, infographics and design thinking also grew significantly. Although awareness of other tools also climbed, their presence was nearly negligible.

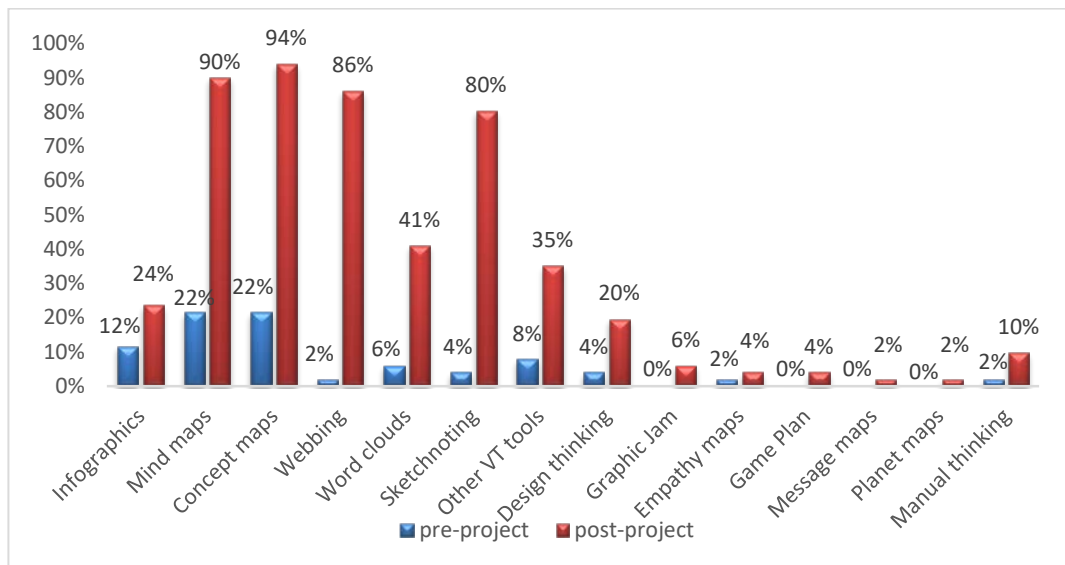


Figure 4. Pre- and post-project command of VT techniques

Students reported that mind (80.4 %) and concept (74.5 %) mapping were the most useful techniques. Webbing was scored lower (52.9 %) and while not proposed, sketchnoting was judged highly by nearly half (47.1 %) of the participants.

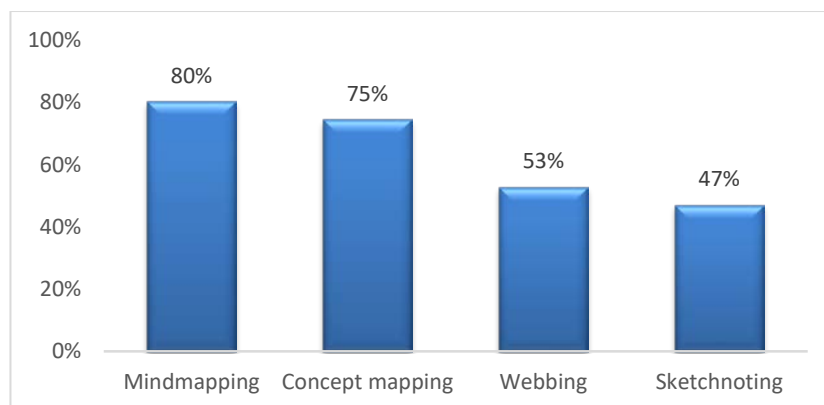


Figure 5. Utility of VT techniques

The post-project questionnaire contained 11 items on project activities and advantages. All 11 were five-point Likert scale questions, for which the mean, median and standard deviation are listed in Table 5.

Table 5. Statistical descriptors for activities

	Mean	Median	Std dev.
Time estimates furnished by teaching team	4.27	4	0.72
Study and review of initial VT technique guide	4.33	4	0.65
Watching teaching team's VT videos	4.33	4	0.74
Formulating your own visual exercises	4.12	4	0.68
Labelling your own visual exercises	4.18	4	0.68
Review of classmates' exercises	4.24	4	0.65
Labelling classmates' exercises	4.06	4	0.68
Assessing classmates' exercises	4.20	4	0.69
Self-assessments	4.57	5	0.61
Q&A video-conference sessions	4.29	4	0.70
Mentoring	4.01	4	0.82

The conclusions drawn from Table 5 are: first, students scored all the project activities very highly, with a mean of over 4 on a scale of 5 for all the items. The activity scored most highly was self-assessment, with a mean of 4.57, followed by watching VT videos prepared by the teaching team, at 4.33. The activity with the lowest score, although still a very good 4.01, was mentoring. Students attached particular importance to peer contributions, scoring use of materials formulated by others (4.24) and classmates' exercises (4.20) more highly than their own (4.12).

Global project valuation has been very positive (Figure 5). In a five-point Likert scale (with 1 meaning lowest value and 5 highest value) 90.3 % of the participants value it with 4 or 5.

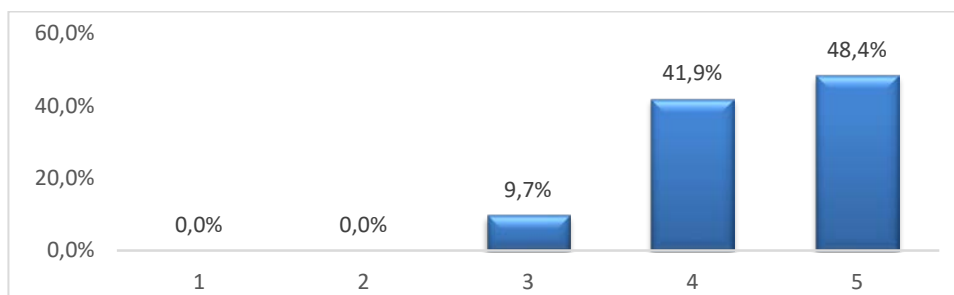


Figure 6. Project valuation

### Assessment of project impact on the course

Project impact was assessed in terms of a suite of items grouped in three major categories. The first was designed to analyse student perception of the impact of their participation on course work and results; the second analysed project compliance with their expectations and the factors that actually were as significant as initially believed (fulfilment of expectations), the third, analysis of the impact of project participation on marks.

The main statistical descriptors for the items on the questionnaire related to the perceived effect of project participation on course work and results are listed in Table 6 and Figures 7-10. The result shown in Figure 10 does not constitute a limitation of the project results. On the contrary, it is consistent with project definition, since conditions for participation made explicit that there will not be an impact on marks, beyond the advantages described above.

Table 6. Perceived effect of project participation on course work and results

	Mean	Median	Std dev.
The project contributed positively to course work	4.43	5	0.81
The project improved course results	3.96	4	1.08
Your mark fairly reflects the time and effort invested	3.41	4	1.25
Project participation affected your exam mark	3.80	4	1.28

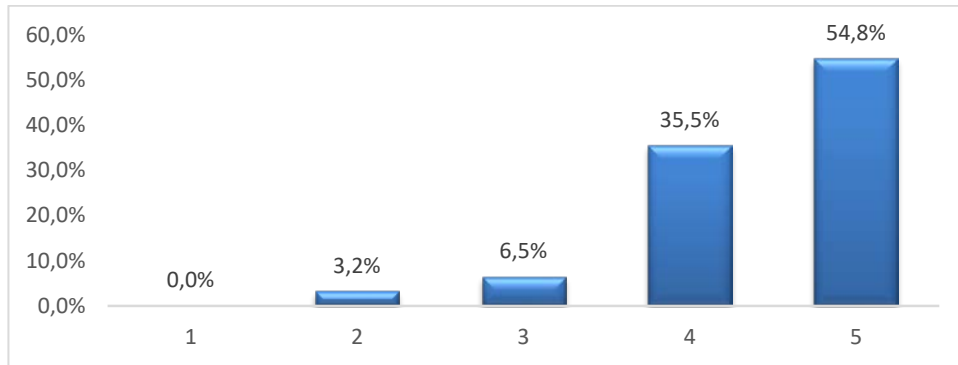


Figure 7. The project contributed positively to course work

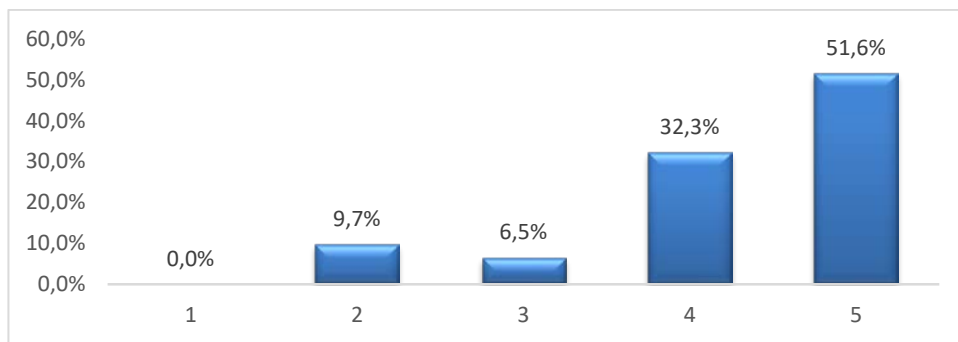


Figure 8. The project improved course results

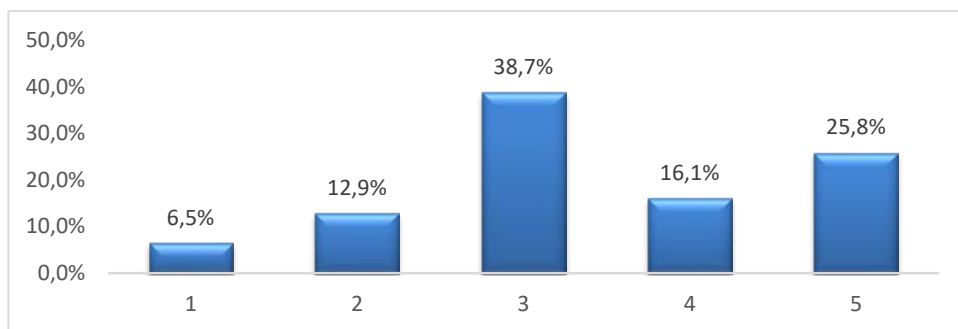


Figure 9. Your mark fairly reflects the time and effort invested

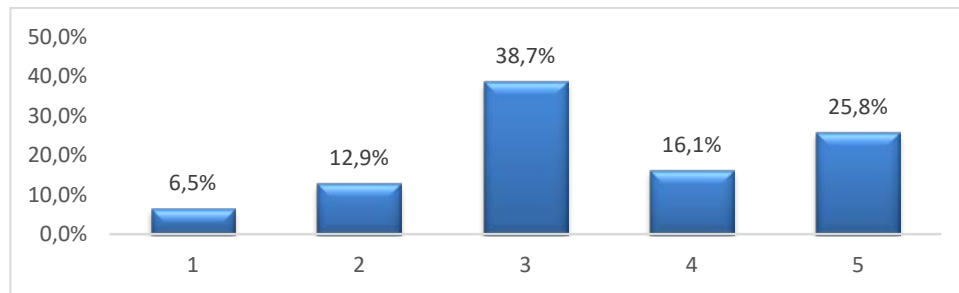


Figure 10. Project participation affected your exam mark

Participants responded positively to all four assertions, with means of at least 3.4 over 5. All students claimed that project participation had a positive effect on course work (4.43 over 5), although the other items on project impact on marks and results scored lower. The one with the lowest mean (3.41) was the perception that the time and effort invested were fairly reflected in the course mark. That subjective perception was wholly unrelated to the actual effect of the project on students' marks. Participants received the project very warmly; 88.24 % would repeat the experience and 92.16 % deemed that similar projects should be available for all courses.

All the items on fulfilment of expectations (Table 7) were scored at 3.7 over 5 or higher. The item most highly appraised, at 4.50, was learning to use visual tools. That finding attests to the need for programme continuation, since one of the main objectives is for students to learn to apply VT tools. Student expectations around the teaching team were likewise fulfilled as regards the utility of guidance furnished through both webinars (4.42) and virtual lessons (4.40). Mentoring received the lowest score (albeit an acceptable 3.7), perhaps due to comparison with the guidance afforded by the teaching team.

Table 7. Project fulfilment of expectations

	The project fulfilled your expectations relative to:		
	Mean	Median	Std dev.
Course work, study time optimisation and planning	4.31	5	1.02
Expected improvement in academic results	3.95	4	1.22
Extracurricular credits	3.97	4	1.13
Teaching team guidance, particularly in virtual lessons	4.40	5	0.87
Learning use of visual tools	4.50	5	0.80
Use of classmates' visual content	4.17	4	1.08
Alumnus mentor's study guidance	3.70	4	1.21
Utility of guidance webinars/chats	4.42	5	0.79

## 5. Conclusions

The study described here shows the importance of creativity and teamwork for BA students. The tools used to test those hypotheses were visual techniques and partnering in a knowledge creation and use community established explicitly for that purpose. The findings showed that participation in innovation initiatives improves students' perception of course procedures with no further motivation than their participation. Teaching team monitoring and self-assessment exercises were deemed to be key course characteristics.

Visual tools (especially mind and concept mapping) proved to have a positive impact on learning, both in terms of academic performance and student satisfaction. A large majority of participants became routine users and advocates of such tools, not only for academic but also for professional and personal use.



Participation in the experience drove interest in other visual techniques, command of which reached very high levels despite not being proposed or used in the project.

Teamwork was evaluated positively by students, not as recipients, but rather as participants willing to share the results of their work, attesting to their interest in contributing to the community of present and future users. Besides, the creation of knowledge communities therefore encourages teamwork.

The combination of visual tools and teamwork has a positive impact on learning, in terms of both academic performance and student satisfaction.

Educational institutions should focus on those elements, among others by working with students with family or occupational obligations. The conclusions applicable to students both at the beginning and throughout their careers when engaging in lifelong education include: 1) follow-up activities are highly appreciated by students; 2) such activities should have a clear purpose-related focus, aligned with professional objectives and employer demands; 3) working groups and learning communities add considerable value for students, who take a very positive view of the importance of their own exercises and the use and assessment of those of others; 4) although incentives are the key for engaging students in initiatives that are not mandatory to pass their courses, when such initiatives are well defined, the incentives are appraised much less positively ex-post than the initiatives themselves; 5) such initiatives not only enhance engagement, but spur student satisfaction with the course and its parameters and have a direct effect on academic results.

The future lines of research of greatest interest in this regard revolve around: 1) the activities associated with the experience described in the context of courses on finance, and 2) the possible relationships between respondents' personal characteristics (demographic, sociological and psychographic) and a) academic performance and b) students' satisfaction. Other conclusions to be drawn from the findings allude to graduates' financial skills, to which growing importance has been attached at all levels of education since the onset of the crisis. All the findings described are being applied in the next stage of the research, currently underway. The team is presently creating a meta-search engine that will enable students to conduct intelligent searches filtered by the exercise name and author, visual technique used and syllabus content based on the metadata available, as well as a contribution valuation tool. The present findings and others not discussed here for lack of space are being taken into consideration in that endeavour. Semantic labelling is deemed to be a key factor by material users. In a second line of research exploring the most useful parameters for generating collective taxonomies (folksonomies), guidelines are being proposed to enhance the effectiveness of user definitions of the terms of greatest utility in collective knowledge creation.

## 6. References

- Anteby M (2013) *Manufacturing morals: The values of silence in business school education*. University of Chicago Press.
- Antón CS, Herrero ME, Castillo AS and Sartori M (2016) Los plurilenguajes en la construcción del conocimiento en los Talleres de Elaboración de Trabajo Final en las carreras de comunicación social de universidades nacionales. In *Actas de Periodismo y Comunicación* (Vol. 2)
- Arguedas R, Vicente JA, Martín R and González J (2018) Innovación en la Universidad: percepción, seguimiento y satisfacción. *Revista Iberoamericana de Tecnologías del Aprendizaje (IEEE-RITA)*, 6(3): 99-107.
- Armstrong A and Page N (2015) Creativity and constraints: leadership and management in the UK creative industries. *Creative skill set*.

- Ayed R, Harrathi F, Gammoudi MM and Farhat M (2014) A Mind map query in information retrieval: the 'user query idea' concept and preliminary results. *Computer Science & Information Technology (CS & IT)*: 197-214.
- Beel J (2017) Towards effective research-paper recommender systems and user modeling based on mind maps. *arXiv preprint arXiv:1703.09109*.
- Bridgman T, Cummings S and McLaughlin C (2016) Restating the Case: How Revisiting the Development of the Case Method Can Help Us Think Differently About the Future of the Business School. *Academy of Management Learning & Education*, 15(4): 724-741.
- Buzan T (2006) *The ultimate book of mind maps: unlock your creativity. boost your memory. change your life*. HarperCollins UK.
- Buzan T and Griffiths C (2014) *Mind maps for business: Revolutionise your business thinking and practice*. Pearson. 2nd edition.
- Cabero J and Marín V (2014) Posibilidades educativas de las redes sociales y el trabajo en grupo. Percepciones de los alumnos universitarios. *Comunicar*, 21(42)
- Colosimo A and Fitzgibbons M (2012) Teaching, designing, and organizing: concept mapping for librarians. *Partnership: The Canadian Journal of Library and Information Practice and Research*, 7(1).
- Datar SM, Garvin DA and Cullen PG (2010) *Rethinking the MBA: Business education at a crossroads*. Harvard Business Press.
- De Haro JJ (2010) *Redes sociales para la educación*. Madrid: Anaya.
- Ferlie E, McGivern G and De Moraes A. (2010) Developing a public interest school of management. *British Journal of Management*, 21(s1)
- Franklin A, Li T, Jamieson P, Semlak J and Vanderbush W (2015) Evaluating metrics for automatic mind map assessment in various classes. In *Frontiers in Education Conference (FIE) 2015 IEEE* (pp. 1-8) IEEE.
- Hammond JS (1980) *Learning by the case method*. Boston, MA: Harvard Business School.
- Hyerle D (1996) *Visual Tools for Constructing Knowledge*. Association for Supervision and Curriculum Development. 1250 N. Pitt Street. Alexandria, VA 22314-1453.
- Hyerle D (2008) Thinking maps: Visual tools for activating habits of mind. *Learning and Leading with Habits of Mind*. ASCD.
- Martín R, Arguedas R and López-Martín C (2018) La aplicación de técnicas de *Visual Thinking* en la materia de Finanzas en estudios de Grado. *Ensayos sobre investigación y experiencias docentes en Economía, Empresa y Turismo*. Madrid: UNED. In press.
- McMurray S, Dutton M, McQuaid R and Richard A (2016) Employer demands from business graduates. *Education+ Training*, 58(1):112-132.
- Messina P, Dominquez V, Parra D, Trattner C and Soto A (2017) Exploring Content-based Artwork Recommendation with Metadata and Visual Features. *arXiv preprint arXiv:1706.05786*.

- Mintzberg H (2004) *Managers. not MBAs: A hard look at the soft practice of managing and management development*. Berrett-Koehler Publishers.
- Novak JD (1977) *A Theory of Education*. Ithaca. NY: Cornell University Press
- Novak JD (1990) Concept mapping: A useful tool for science education. *Journal of research in science teaching*, 27(10): 937-949.
- Novak JD (1991) Clarify with concept maps. *The Science Teacher*, 58 (7): 45-49.
- Novak JD and Cañas AJ (2006) The origins of the concept mapping tool and the continuing evolution of the tool. *Information visualization*, 5(3): 175-184.
- Patmore J, Whittaker S, Watkins S and Hessey S (2009) The management of creativity and innovation. *White Paper. BT Exact. London.*[Google Scholar].
- Riebe L, Girardi A and Whitsed C (2017) Teaching teamwork in Australian university business disciplines: Evidence from a systematic literature review. *Issues in Educational Research*, 27(1): 134-150.
- Rodrigo C, Martín R and Arguedas R (2013) Adaptación multicultural de recursos educativos en abierto: Factores de éxito en el portal Openscout". *El profesional de la información*, 22(6): 537-544.
- Ruiz RM, López FC and Millán J (2013) Experimentando con las redes sociales en la enseñanza universitaria en ciencias. *Revista Eureka sobre enseñanza y divulgación de las ciencias*, 10(3): 394-405.
- Runhaar, P. (2017). How can schools and teachers benefit from human resources management? Conceptualising HRM from content and process perspectives. *Educational Management Administration & Leadership*, 45(4), 639-656.
- Sánchez MM, Prendes MP and Serrano JL (2010) Modelos de interacción de los adolescentes en contextos presenciales y virtuales. *EduTec-e. Revista electrónica de tecnología educativa*, 35. Available at: [https://digitum.um.es/jspui/bitstream/10201/37460/1/EduTec-en35\\_Sanchez\\_Prendes\\_Serrano.pdf](https://digitum.um.es/jspui/bitstream/10201/37460/1/EduTec-en35_Sanchez_Prendes_Serrano.pdf)
- Schwendimann BA (2015) Concept maps as versatile tools to integrate complex ideas: From kindergarten to higher and professional education. *Knowledge Management & E-Learning: An International Journal*, 7(1): 73-99.
- Serrano MD and da Cunha EF (2016) Uso de las redes sociales por los alumnos universitarios de educación: un estudio de caso de la península ibérica/Use of social networks by college students: A study case in the Iberian Peninsula. *Tendencias Pedagógicas*, (28): 33-44.
- Somers MJ, Passerini K, Parhankangas A and Casal J (2014) Using mind maps to study how business school students and faculty organize and apply general business knowledge. *The International Journal of Management Education*, 12(1): 1-13.
- Tseng KH, Chang CC, Lou SJ and Hsu PS (2013) Using creative problem solving to promote students' performance of concept mapping. *International Journal of Technology and Design Education*, 23(4): 1093-1109.
- Zipp G, Maher C and D'Antoni AV (2015) Mind Mapping: Teaching and Learning Strategy for Physical Therapy Curricula. *Journal of Physical Therapy Education*, 29(1): 43-48.

# Authors Index

Adams, S.	346	Helpfenberger, M.	25, 367
Andreu, A.	253	Herrero de Egaña, A.	284
Arguedas, R.	413	Hewson, E.	36
Aydın, S.	275	Hilliard, J.	309
BADONNEL, R.	86	Huion, P.	112
Bastos, G.	299	Jefferis, H.	15
Bañeres, D.	142	Jones, A.	15
Bendito Cañizares, M.	101	Juberías, G.	290
BERGER, O.	86	Kalantzi, R.	379
Betrancourt, M.	131	Kalles, D.	224
Bidarra, J.	167	Kanninen, M.	237
Braithwaite, N.	181	Karadeniz, A.	142
Brown, V.	181	Kear, K.	309
Casarin, H.	299	Kumtepe, A.	148, 156, 275
Chung, G.	36	Kurttila, J.	61, 259
Collins, T.	181	Lane, B.	270
Costello, E.	270	Linschinger, N.	346
Daniela, L.	336	López Martín, C.	413
de Diego Angeles, P.	290	Manhiça, D.	167
de la Concepción, M.	209	Martín-García, R.	413
de Langen, F.	82	Martínez Quintana, V.	209
Domingue, J.	123	Melai, T.	360, 403
Domínguez, I.	48	Mikroyannidis, A.	123
Domínguez, M.	48, 389	Moalic, D.	86
Donelan, H.	309	Moerkerke, G.	360
Espinosa, M.	48, 389	Mora Umaña, A.	73
Estebas-Vilaplana, E.	324	Muurimäki, R.	61, 259
Esther, S.	253	Muñoz, A.	284
Feliz-Murias, T.	197, 253	Nevalainen, S.	61, 259
FOUZAI, J.	86	Novo, A.	299
García-Serrano, A.	101	O'Dowd, I.	1
Gardner, C.	15	Orphanoudakis, T.	379
Genc Kumtepe, E.	148	Ozturk, A.	148, 156, 275
Gorman, T.	237	Palo, M.	237
Guerrero-Roldán, A.	142	Pannatier, M.	131
Gutiérrez, I.	25	Pannekeet, K.	360, 403
Heaney, C.	309	Pereira Calvo, A.	253

Prendes Espinosa, P.	25	Solans, M.	324
Prádanos, R.	389	Soria, C.	284
		Strods, R.	336
Recio Moreno, D.	197	Suhonen, S.	61, 259
Rodríguez, M.	142	Syrjä, T.	237
Rolin, P.	86	Taishoff, M.	182
Romero, L.	48	Third, A.	123
Rosewell, J.	309	Ugurhan, Z.	148
Rubene, Z.	336		
		Van den Munckhof, R.	360
Sanchez Botas, F.	101	Wopereis, I.	360, 403
SARGENTI, P.	182	Yahyaee, A.	389
Sayer, A.	112	Zafeiropoulos, V.	224
Saykili, A.	148		
Schlusmans, K.	360		
Simón Fernández, I.	253		

