

Best of EDEN 2018

**Special Issue of the
European Journal of Open, Distance and E-Learning**



The best research papers presented
at the 27th EDEN Annual Conference and 10th EDEN Research Workshop

Annual Conference, 2018 June, Genova
10th EDEN Research Workshop, 2018 October, Barcelona

Edited by
Ulrich Bernath, András Szűcs

European Distance and E-Learning Network, 2019
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Introduction

EDEN is delighted to present the 2018 Volume of the Best of EDEN series.

The book consists of selected papers of the EDEN Annual conference hosted by the University of Genova in June 2018 and those of the Research Workshop organized in co-operation with the Universitat Oberta de Catalunya (UOC) in Barcelona in October. The papers were selected in process of the competition for the “Best Research Paper” of the conferences, which is a tradition at the EDEN Events. The selection process takes place in collaboration with the Ulrich Bernath Foundation for Research in Open and Distance Learning. In 2018, the 10th Anniversary of this movement has been celebrated.

Starting from its origins, an important duty of EDEN has been to exchange academic and professional experience, to promote navigation on the rapidly evolving scene. Research in open, distance and e-learning is indispensable for development, decision-making and for improving quality of services.

High quality research into open learning provides important information to enhance learning with technologies, improving the learner’s experience, to assist effective decision-making, and helps to ensure the viability of products and services.

An important innovation in the approach to the Research Workshop has been the PhD Student Symposium with the participation of 30 young scholars. The Symposium, led by a panel of international experts on e-learning, has been designed to foster the exchange of experiences and knowledge among doctoral students doing research in the area, while providing a discussion forum for the advancement of doctoral research.

The demand for people with new, enhanced skills is growing. The volume of information produced and shared in all fields is overwhelming. Building the data economy became part of the EU Digital Single Market. Pressure is on all players of the online education community to keep up with new learning solutions, and better supply the skills currently demanded by growing economies. Digital credentials and open badges are the new currencies which are beginning to transform the economic models in education. Social and economic tensions continue to raise the issues of scalability, the micro-credentialling of education, training and skill development processes.

Micro, meso and macro aspects provide an interesting range of lenses for considering the problem. Navigating these dimensions are the reshaping of digital pedagogy and online instructional design; the social elements including digital societal mechanisms and the position of the individual in our new era. Social and socio-economic context is more important than ever. Society itself can be understood as a learning environment, with questions of learners’ connection with the community and the empowerment of the practitioners.

In the networked society, digital technology has changed many aspects of day-to-day life. Long-standing societal, business and institutional systems have either lost their relevance or have transformed beyond recognition. In education we observe emerging and declining paradigms,

changing expectations from society, new and emerging types of learning experience and often operating in unsteady environments. The powerful combination of the 'information age' and the consequent disruption has taken a fantastical leap into aggregating, curating and co-producing outside the boundaries of formal learning.

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Budapest – Oldenburg, December 2019

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Stuck in the Middle? Making Sense of the Impact of Micro, Meso and Macro Institutional, Structural and Organisational Factors on Implementing Learning Analytics

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Best Research Paper Award Winner

Introduction

Despite evidence that learning analytics has become institutionalised within higher education since its emergence in 2011 (Ferguson, 2012; Gašević, Dawson, & Siemens, 2015), there remain questions regarding its impact on informing curricula, pedagogy and ultimately, on student success (Ferguson et al, 2016; Ferguson & Clow, 2017; Kitto, Shum, & Gibson, 2018). A variety of factors may impact on the implementation of learning analytics (e.g., Leitner, Khalil, & Ebner, 2017; Lonn, McKay, & Teasley, 2017; Scheffel, Drachler, & Specht, 2015). Despite its huge potential to inform and support learning, learning analytics may become stuck in the middle of, inter alia, the need to balance operational needs and resource allocation, and different perceptions of learning, agency and loci of control in learning, teaching and macro-societal factors. In this *conceptual* paper, we propose an institutional cartography of learning analytics and explore the impact of a number of micro, meso and macro institutional factors that may impact and shape the institutionalisation of learning analytics. As a conceptual basis for developing this cartography, we utilise the Subotzky and Prinsloo (2011) socio-critical model for understanding student success.

Academic and learning analytics: Spot the difference

As the availability of datasets has grown, higher education institutions have increasingly analysed educational data with a view to better understanding how effective learning takes place. Data mining first appeared as a means of analysing databases in order to uncover patterns within data. Educational data mining is particularly concerned with developing data mining and machine learning techniques

with a view to better understanding students, and the settings in which they learn (Ferguson, 2012; Papamitsiou & Economides, 2014).

Analytics within higher education tends to be classified as either learning analytics or academic analytics (Siemens & Long, 2011). Although there may be datasets in common, the two terminologies largely reflect the different purposes to which student data might be put. Academic analytics generally refers to uses of (mostly aggregated) student data in courses, programs or qualifications, at an institutional or (inter)national level – at a meso or macro level. The purposes of academic analytics include regulatory reporting (for example, for funding purposes), and marketing (to potential students and alumni), as well as high level information on learner profiles (for example, to develop a national picture of student demographics), and staff records.

Fundamentally, learning analytics is designed to support greater insight into how students learn (Gašević, Dawson, & Siemens, 2015). This might include work at the individual (micro) student level: for example, tracking student progression with a view to improving completion or predicting student likelihood of completion in order to provide proactive support. Learning analytics also encompasses module or qualification wide (meso) analyses in support of curriculum design; for example, to facilitate implementation of assessment or tuition strategies which support student success. Often, when students at risk or with special needs are identified in learning analytics, institutional responses and where necessary, resource allocation, are approved at the meso level.

The issues and policies which impact on the collection, analysis and use of student data exist at micro, meso and macro levels. Developing a greater understanding of how these issues exist and operate across all three levels may help to reduce some of the complexities involved in successfully institutionalising learning analytics.

A social-critical understanding of successful learning

Central to learning analytics is learning and the effectiveness of learning (Gašević, Dawson, & Siemens, 2015). In the context of higher education, research into the effectiveness of learning is well-documented, as per the early theoretical models developed by Spady (1970), and Tinto (1975; 1988; 2006). Though these models form the basis of much of the research on student success, they also attract criticism. Some feel that such models over-emphasise student agency and the responsibility of students to “fit” into organisational cultures (e.g., Braxton, 2000), while others argue

that they reflect North-Atlantic geopolitical, epistemological and social realities, and assume a universal validity (e.g., Subotzky & Prinsloo, 2011). Much of the published research focuses on selected individual variables, forgetting that student success is a complex and dynamic phenomenon found in the intersection of student’s habitus, capital, prior educational experiences and life-worlds (micro), the character, values, processes, resources and efficiencies of institutions (meso), and “supra-institutional (macro-political and socio-economic factors)” (Subotzky & Prinsloo, 2011; p.179) (macro). Figure 1 provides an overview of the main tenets of Subotzky and Prinsloo’s socio-critical model of student success (2011). The central “student walk” provides a linear view of student progression from the moment of registration up to successful graduation. The main agents in this “student walk” are students and the institution. Unique to this model is the third element of the broader societal context, impacting on both students and the institution.

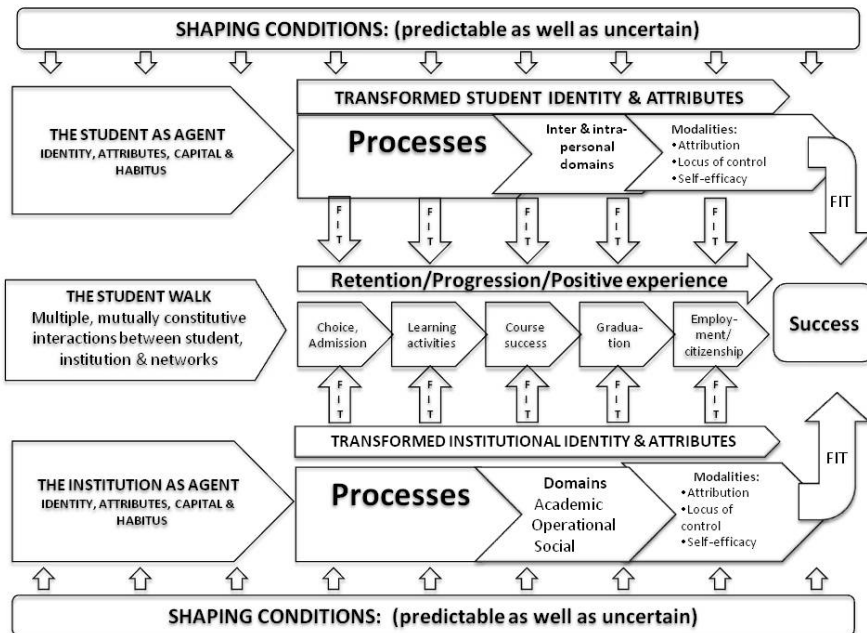


Figure 1. A socio-critical model of student success (Subotzky & Prinsloo, 2011)

Subotzky and Prinsloo’s socio-critical model (2011) proposes a number of key constructs to understand the complexities and effectiveness of teaching and learning.

These are:

- *Situated agents: student and institution.* This construct emphasises that students are not helpless recipients of services but that they have some agency. However, we should also accept that the agency of both students and institutions is constrained. The situatedness of both means that “attributes and behaviours are strongly shaped by the structural conditions of their historical, geographical, socio-economic, and cultural backgrounds and circumstances. Nonetheless, as agents, they enjoy relative freedom within these constraints to develop, grow, and transform their attributes in pursuit of success” (Subotzky & Prinsloo, 2011; p.184). We note here that this model deviates from earlier models for understanding student success in the explicit recognition of student agency and responsibility.
- *The student walk.* Subotzky and Prinsloo (2011) refer to “the numerous ongoing interactions between student and institution throughout each step of the student’s journey” as the “student walk” (p.185). What happens ‘in the middle’ between students and the institution is often mutually constitutive and interdependent. The ‘student walk’ and both parties’ ability and responsiveness to the learning journey are shaped by connections on both sides to players and circumstances outside of that journey.
- *Capital.* This refers to the role of different kinds of capital, including financial capital but also “cultural, intellectual, organizational, and attitudinal forms of capital” (p.186) in the decisions and (in)actions of both students and the institution. Student capital is dwarfed by the symbolic and cultural capital of the institution.
- *Habitus.* Subotzky and Prinsloo (2011) refer to Bourdieu (1971) and Braxton (2000) and describe the notion of habitus as “the complex combination of perceptions, experiences, values, practices, discourses, and assumptions that underlies the construction of our worldviews” (p.186). The habitus of both students and the institution affect how they see risk, success, and the factors that shape the chances of dropout or success. Early models of student success and failure (Spady, 1970; Tinto, 1975) normalised students’ chances of success as their (in)ability to be assimilated into accepted norms, worldviews, and assumptions undergirding student learning. When students enter higher education, they do not leave their habitus at the door. Often their habitus (ontologies and epistemologies) will collide with that of the hosting institution. Then, depending on their capital and loci of control, they will negotiate a way through the “student walk”.

- *The domains and modalities of transformation.* In reference to students, Subotzky and Prinsloo (2011) refer to intra- and interpersonal domains and how these shape students' approaches to, and strategies in, their learning journey. In respect of the providing institution, the three domains of academic, administrative, and non-academic social domains of institutional life interact with students' intra- and interpersonal domains in complex and often interdependent ways.
- *Student success.* The sixth construct suggests that "student success" may not be fully understood. Measuring student success is commonly assumed to refer to course success or successful graduation (measured as time-to-completion). With an emphasis on student satisfaction in higher education, there is also the possibility that success can be defined as a satisfactory experience. Finally, student success may also refer to the "successful fit between students' graduate attributes and the requirements of the workplace, civil society, and democratic, participative citizenship" (Subotzky & Prinsloo, 2011; p.188).

Mapping macro, meso and micro institutional structural and organisational factors

Much of the literature around learning analytics assumes that outcomes are determined either by the actions or characteristics of the individual – the student – or by the behaviours of cohorts of students at a module or subject level. Subotzky and Prinsloo's socio-critical model (2011) provides a useful framework to examine a range of factors at micro, meso and macro levels which have the potential to impact and shape the institutionalisation of learning analytics.

Macro factors

At first glance, it may appear that few issues have any real impact on the implementation of learning analytics at a macro level. In this section, we make the case that the concept of habitus - the habits, skills, and dispositions shaped by life experiences - has relevance at each level - micro, meso and macro. At an institutional level, habitus will be influenced by the national context as well as by the views and perceptions of senior management. These will shape how data are defined, what data are collected and the underlying beliefs around what that data represents. In the context of learning analytics, analysis and action are often driven by available data rather than actual need. This can be exacerbated by a lack of political will to engage students in the meaning of their data, on what is collected, when it is collected and what other data may provide both the institution and learners with a more

comprehensive view of students' habitus and capital in the *student walk* (Prinsloo, 2017).

Similarly, the notion of capital – the assets that a party can bring to bear – has application across each level. The acquisition of capital is likely to be impacted by socio-economic and cultural contexts. It has been argued elsewhere that institutions have a fiduciary and moral duty to use their capital to ensure effective, ethical and caring and appropriate learning experiences (Slade & Prinsloo, 2013; Prinsloo & Slade, 2016). Not only must institutions provide ethical oversight on the collection and analysis of students' data to establish the scope and value of their *capital* (Willis, Slade, & Prinsloo, 2016), but they should also accept a contractual and moral responsibility to ensure the ethical allocation of resources in response to the analysis of student data (Prinsloo & Slade, 2017).

Learning analytics is often used to examine students' behavioural data which, in many respects, are the outcome of the interplay of their different kinds of capital in response to pedagogical strategies, curriculum coherence, stimuli and events in their life-worlds outside of their studies. It is pertinent to note that there is little evidence of equivalent reflection of the institutions' capital and how that capital is used to support and ensure effective, appropriate and high-quality learning journeys via the systematic collection, analysis and use of institutional data, across and between strategic and operational silos.

Institutions are often faced with regulatory issues, such as changes in the funding regime, which seriously impact and hamper both their offer and their response to operational challenges, increasing competition and supporting students. As Prinsloo and Slade (2017) indicate, institutions' ability to respond to students' identified risks and support needs, is, in many respects, “an elephant in the learning analytics room” (p.1).

Meso factors

Although students have a clear responsibility to contribute to their own student walk, there is less attention directed to other partners in that walk, namely faculty and support staff, and the institutions themselves. The current drive to collect as much student data as possible (without always knowing its potential purpose) is starkly juxtaposed by the lack of an institutional commitment and resource allocation to keep track of, surveil and build institutional profiles of actions taken by course teams and the ways in which support and study resource are allocated within courses and

faculties. It is likely also that the existence of departmental silos leads to a loss of shared insight as well as subsequent inefficiencies and a lack of real understanding of both the raw data and the subsequent analysis.

Learning analytics can get “stuck in the middle” as a result of a focus on role of the student without equal consideration of the (in)actions of others in the learning journey. Similarly, the social domain of the institution – its culture, power relations, and dominant ideology – has a significant impact on academic and administrative strategy. Recognizing and addressing this is an essential feature of the socio-critical model (Subotzky & Prinsloo, 2011).

The construct of *situatedness* has important implications for the potential of learning analytics to effectively address students’ needs and risks. Learning, as proposed by Subotzky and Prinsloo (2011), is caught between the constrained agency of two players, namely students and the institution. However, given the asymmetries in the power relationship between students and the institution, and the ways in which institutional processes, rules and regulations impact on student learning, it would not be reasonable to take an approach to learning analytics which focuses only on what students do or don’t do. Though students have agency, such that some of their decisions about learning fall within their loci of control, in practice their agency and loci of control are constrained. What students do or don’t do is often in response to instructional and institutional intentions and (in)actions.

Another issue in the context of student (constrained) agency is that of student consent. Generally, it is assumed that students’ acceptance of the Terms and Conditions at the moment of enrolment provides the institution with blanket permission to have their data collected, analysed and used. While the use of student aggregated data (as proposed in Academic Analytics) is provided for in the contractual, fiduciary duty of the institution, the ethics around the collection, analysis and use of individualised and identifiable student data to shape their learning is unclear (Willis, Slade, & Prinsloo, 2016). With changes in international data regulations (e.g., the European General Data Protection Regulation, GDPR), there is increasing pressure on higher education to develop a nuanced regulatory framework to ensure the legally compliant, but also morally justifiable option to allow students to opt-out of the collection, analysis and use of their data (Sclater, 2017).

Micro factors

We have access to increasing volumes of student data, and also to a greater variety, velocity and granularity of student data. Institutions harvest and analyse behavioural data, and combine this with demographic and historical learning data, and data from sources such as the library, student counselling, and, increasingly, from social media. As such we have increasingly detailed views of individual student identities, behaviours and networks. We use this data to understand and describe student learning, to diagnose their needs, risks and potential, to predict chances of success, failure and their need of institutional resources, and increasingly to prescribe personalised / individualised curricula, assessment, learning pathways and future enrolments. Such determinations are weakened when data is not complete or where proxies are used to substitute for missing datasets. Where data proxies are used in predictive analytics, there is also a danger of creating false positives, identification of individual students deemed to be at risk as a result of unrepresentative datasets.

In a learning analytics context, less attention is paid to the intra-personal domain of the student – the range of individual psychological attributes required for successful study, such as positive attitude and beliefs, self-discipline, motivation, and confidence since these are not routinely captured nor easily measured. There is a growing focus on the inter-personal domain – the social interactions which can support learning and understanding (Ferguson & Shum, 2012; Perrotta & Williamson, 2016).

Subotzky and Prinsloo (2011) discuss how notions of causality and attribution, control and efficacy play out in the student walk. In the field of learning analytics research, there are concerns that data are used, incorrectly, to prove causality rather than simple correlation (Ferguson et al., 2016). For both students and institution, there are factors within the control (or perceived control) of students and/or the institution, but also many that fall outside the loci of control of both students and institution. It is often assumed that the mere act of identifying a factor in a student's strategies or learning behaviours, will allow that student to make a change. Although we should not label students as helpless, we should also not underestimate the impact of intergenerational, context-specific and structural elements which may constrain their self-efficacy and loci of control.

Subotzky and Prinsloo's five constructs (2011) culminate in the concept of student success. One of the many attractions of learning analytics is its promise of identifying students at risk of not being successful. Models of student success are often comparative – measuring current students against the characteristics, demographics

and behavioural data of students who have previously successfully completed a course or programme. This can result in such feedback as “our research indicates that students like you...”. There is a danger in equating a predicted outcome based on historical student behaviours and characteristics with an actual outcome, effectively pre-labelling students as successful or not. In addition, Woodley (2004) warns that we should not pathologise student dropout in distance education contexts because the motivations and individual measures of what makes for successful study may vary. In this case, it becomes difficult to use the statement ‘students like you’ in any meaningful way.

(In)conclusions

Learning analytics as a practice, discipline and research focus has matured. There are however concerns regarding a lack of evidence of its ability to impact positively on students learning (Ferguson & Clow, 2017), and suggestions that learning analytics is, in many respects, *imperfect* (Kitto, Sum, & Gibson, 2018). Though there is research that maps and explores the many factors that impact on the institutionalisation of learning analytics (Ferguson, 2012; Scheffel, Drachsler, & Specht, 2015), this paper provides a perspective on three levels – micro, meso and macro – of factors that shape and impact the effectiveness of learning analytics. Much of the learning analytics literature is focused on the individual student, at a micro level, and on how student characteristics and behaviours determine outcomes. This paper suggests that such a focus may be misguided. In viewing the factors which impact on student learning from a *socio-critical* perspective, we find that many (as identified through learning analytics and communicated to students, faculty and support staff through dashboards and early warning systems) may fall outside students’ loci of control.

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Using Business Simulation Games to Help Students Prepare for Survival in the Workplace

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Abstract

Business professions seek workplace entering graduates with integrated knowledge and soft skills that are not sufficiently taught at universities. Students have an innate propensity for learning through play and exploration. We do not know how business simulation and games can prepare students across the performance spectrum for the workplace, and which learning domains play a role. A mixed methods exploration was conducted on 108 first year and 601 third-year students.

First-year Accounting Science students new to the subject, with lower marks, playing a board game on the accounting cycle benefitted more from the knowledge components of the subject compared to students with higher marks, who gained more soft skills, valued making the acquaintance with other students and far transfer to the real profession.

Senior Auditing students across all grade categories who participated in an online auditing simulation benefitted most from engaging with a real-life scenario. The lower performing students learnt slightly more theory and developed more skills as the top-performing students and their affect due to the simulation was higher than the others. Simulations provided motivation and interest that helped novice students master theory and skills, while experts gained soft skills and far transfer into solving complex workplace problems.

Abstract in Afrikaans

Die sakewêreld verwag van nuwe professionele graduandi om geïntegreerde kennis en vaardighede te bemeester, wat nie voldoende aandag by universiteite geniet nie. Studente is gretig om deur spel en verkenning te leer. Ons weet egter nie hoe simulaties en bordspeletjies studente met verskillende prestasie vaardighede die studente vir die werksplek voorberei of watter leer-aspekte 'n rol speel nie. Deur gebruik te maak van 'n gemende metode benadering, is terugvoer van 108 eerstejaarstudente en 601 derdejaarstudente ontleed.

Eerstejaar rekeninkundige wetenskap-studente met meestal lae punte, het 'n rekeningkunde bordspel in groepe gespeel, en hulle het veral baat gevind uit die vakkenniskomponente van die spel. Dit kontrasteer met studente met hoër punte wat dit nuttig gevind het om klasmaats te ontmoet, en die verband met die profesie te verken.

Senior Ouditkunde studente oor die hele spektrum van punte wat aan 'n aanlyn oudit simulatie deelgeneem het, het baie geleer van die binnewerking van 'n werklike praktyk. Die studente met laer punte het effer meer teorie en vaardighede bemeester in vergeleke met dié met hoër punte. Hulle het ook meer positief oor die simulatie gevoel. Die simulatie het die laer-presterende studente dus geïnteresseer en aangemoedig om die vakteorie en vaardighede te bemeester. Beter presterende studente daarenteen, het mensvaardighede asook die oplos van komplekse toegepaste problem, soos in die werkplek verlang, bemeester.

Keywords: accounting education, auditing education, board game, online simulation, performance levels

Introduction

Watching young mammals in the wild romp and play, it is easy to recognise that children also develop skills, physical strength and social cohesion through play, imitation and role play. People have been learning new things without books or lectures since the dawn of civilisation. The key to their survival is practicing the necessary skills in a secure environment. Human survival today has a new face, it is called the workplace. But the characteristics of those learning activities are as relevant today as before.

Games and simulations are increasingly incorporated into higher education and corporate training, and are particularly popular in the business disciplines (Clarke, 2009). Blended learning allows the enrichment of lecture-based courses through physical face-to-face, computer-based and web-based games and simulations that make unique contributions to the learning process. As with many new technologies, the hype or novelty effect sometimes conceals the real learning value, and causes teachers to view games and simulations with suspicion. Considering the cost and trouble of rolling out such activities, average increase in class grades do not hold enough promise. In this study, students in different academic years in the same B Com degree participated in two simulations of professional practice in the Accounting sciences. We explored the perceived value such simulations held for students with dissimilar learning proficiencies.

Literature

Learning

From jungle to the present

From the earliest times people learnt important things necessary for survival through play (Montagu, 2017), and remembered their history for hundreds of years through oral traditions (Laylander, 2006). Stories help shape information into coherent wholes called schemata that help the learner remember complex related information (Hill & Hannafin, 1997). Learning new things is more effective if they are anchored in a familiar context, or relate to something that is already known, which is defined as pre-knowledge (Merrill, 2002). There is neurocognitive evidence for how people learn. “The brain, a pattern-finding organ, seeks to create meaning through establishing or refining existing neural net-works; this is learning” (Wolfe, 2006; p.35).

The best and most natural way of learning how to do something is by active experience (Kolb, Boyatzis, & Mainemelis, 2000; Papert, 1993). The activities needed for experiential learning differ by disciplines in Higher Education (HE) (Drake, 2011; Gosen & Washbush, 2004; Miettinen, 2000). Papert (1993; p.141) observed that the best learning takes place when the learner takes charge, stating that “you can learn without being taught and often learn best when taught least”. Unfortunately, experiential learning by doing, though highly desirable and more effective than passive instruction, is hard to implement in a classroom (Kolb et al., 2000; Schank, 2001), often limiting its use. As it is difficult to implement meaningful class activities in short periods of contact time, activities are limited to knowledge acquisition. Simulations and games are closer to how people really learn.

Learning taxonomies

Bloom (1956) taxonomy of the cognitive domain formulated in 1956 is still popular in HE, describing the levels of achievement of learning outcomes (Huitt, 2004). Later revisions extended the taxonomies to three domains (Carter, 1985; Ferris & Aziz, 2005; Huitt, 2004), namely:

- Cognitive learning: mental skills or knowledge (*knowing*)
- Psychomotor: manual or physical skills (*doing*)
- Affective learning: feelings or emotional areas, motivation, attitude (*being*).

Universities have been describing learning outcomes mainly in the cognitive domain, as what the student should *know*. With the advent of outcomes-based education,

descriptions changed to what students should be able to do, combining *knowing* and *doing*, suggesting that domains are not separate and independent, raising questions about the value of the affective domain.

Learning in the affective domain means internalising and organising values into a system or philosophy that can be applied in life (Krathwohl, 2002). As students' *being* changes, so does learning in the other domains, because emotion affects what is learned and what is retained (Wolfe, 2006). Affect also underlies the enjoyment of learning, helping students retain concentration and motivating them to engage and persist with activities (Wojciechowski & Cellary, 2013). Learners are usually intrinsically motivated to learn when they are actively engaged in the learning process, because they find the experience intellectually exciting and joyful (Papert, 1993; Yang, 2017), but selected activities should also align with the learning outcomes.

Alignment in learning outcomes

Constructive alignment between intended learning outcomes, teaching and assessment ensure that the outcomes can be achieved by everyone (Biggs, 2014). Aligning course outcomes with qualification standards make sure that students are not overloaded with tasks, because that discourages deep approaches to learning (Boud, Cohen, & Sampson, 1999). Learning is about what the student does, not what the teacher does. As learning progresses it becomes more complex, while learning outcomes could also prepare students for the workplace.

Outcomes for the workplace

The rapidly changing environment of business professions requires new skills while workers should also be able to execute more complex activities (Neelen & Kirschner, 2018). However, HE is not preparing graduates to survive in this jungle. Transfer of knowledge from textbook to the workplace is crucial, but formal education does not integrate those skills sufficiently for workplace application. Salomon (1992) distinguishes near transfer (to closely related contexts and performances) from far transfer (to rather different contexts and performances), which is the sought-after workplace skill. Authentic experiences for students, however, is hard to find, and often quite dangerous (Schank, 2001). Students need to experience the effects of their actions, but in a safe environment, where they can fail without dire consequences, and learn from mistakes. Such an environment is created in a game or simulation that represents reality.

Game-based learning

Board games

Adults have been playing board games in the Middle East for more than 3500 years and dice for at least 5000 years, using painted stones, bones, flat sticks and later dice made from more durable materials like brass, ivory, marble. Games about military tactics and strategy hail from about 13th century BC, and some resembled modern chess in certain characteristics (Attia, 2016). The Romans played a game similar to today's popular Backgammon, while Monopoly, whose precursor dates from 1904, still teaches players today about rentals, real estate and becoming rich. What these games have in common is the intended learning outcomes of understanding abstract principles and developing strategic thinking (Attia, 2016). Today, both new and old table-top games are based on the original principles and represent a multi-million-dollar industry. Technology allows board games to be played real-time, online and world-wide, with players building communities and sharing strategies (Attia, 2016). Such games have the potential of enhancing formal learning situations in HE. The essential attributes of educational games include: "player or players, conflict [or cooperation], rules, predetermined goal of the game ... artificial ... pedagogical nature" (Sauvé, Renaud, Kaufman, & Jean-Simon, 2007; p.248) and the development of specific skills.

Simulations

In the literature simulations have various definitions. Kindley (2002; p.2) sees simulations as "dynamic, moving learning events in which you actually perform a job and experience the results as if you were really there". Sauvé et al. (2007; p.253) concluded that a "simulation is a simplified, dynamic and precise representation of reality defined as a system". Thavikulwat (2004) added the dimension of technology creating an artificial environment with the participants inside. Therefore, a simulation requires a dynamic and simplified model of reality that should be perceived as true, valid and precise by the user and the purpose thereof is to improve the understanding of the reality by the user (Kindley, 2002; Maier & Größler, 2000; Milrad, 2002; Sauvé et al., 2007).

The advantages of simulations have been well documented, and except for bridging the gap between theory learned and the practical application thereof (Bradley, 2006; Weller, 2004), they allow for critical thinking and a deeper learning approach (Beckem II & Watkins, 2012; Clarke, 2009) giving students a visual glimpse of the practical scenario (Clarke, 2009). Later research defined the purpose of a simulation as enabling

students to experience how the theoretical knowledge plays out in real life, which allows for bridging the gap that educators have struggled with for decades, especially in accounting education (Anderson & Lawton, 2009; Beckem II & Watkins, 2012; Bradley, 2006; Carmichael & Willingham, 1969; Siegel, Omer, & Agrawal, 1997; Silvia, 2012). When the simulation is based on the identified skills, work challenges, activities and scenarios encountered in reality, scenario-based training can be effective to develop complex skills that are needed in the workplace (Carenys, Moya, & Perramon, 2017; Saurin, Wachs, Righi, & Henriqson, 2014), making simulations a more attractive option compared to games.

Autonomous training interventions like business simulations mimic a real environment and characters, while integrating the needed knowledge, skills and attitudes. Such simulations also facilitate the transfer of those skills to new situations (Alessi & Trollip, 2001; Asiri, Greasley, & Bocij, 2017; Saurin et al., 2014). An overview of research on business simulations and gaming confirm their importance as powerful teaching tools, their flexibility to teach diverse subjects and skills, and their relationship to performance (Faria, 2001) and with advancements in technology, simulations are moving online.

Digital online simulations

A fully online simulation can provide simulated experiences that allow students to learn by doing in ways never possible before and to immerse themselves into the role-play of the simulation (Schank, 2001; Silvia, 2012). Online simulations, like games, generate high levels of engagement (Carenys et al., 2017) and serves as an antidote to the resources and capital required to use instructors to monitor and steer the scenarios. Online simulations have become more popular and include activities such as videos, student manuals and case studies, all of which are developed from real-life experiences (Siddiqui, Khan, & Akhtar, 2008; Wynder, 2004). The benefits of an online simulation are that it is not limited to time and space and it allows for instant feedback on decisions (Siddiqui et al., 2008; Wynder, 2004). It offers the same hands-on experience to all students, thus making it possible to accommodate large classes (Buckless, Krawczyk, & Showalter, 2014); it allows for asynchronous learning and students are allowed to “fail fast, fail often, but fail safely” (Kindley, 2002; p.1). In addition, a computerised simulation allows participants to visualise (Clarke, 2009) and obtain a holistic understanding, because information is not compartmentalized by chapters or lectures (Anderson & Lawton, 2009). Three prominent drivers in an effective educational game are skills development, motivation and fidelity.

Skills development

Playing games let participants practice skills, build knowledge and develop fluency and mastery (Papert, 1993). Games are also strong motivators to achieve perfection through practice, making games attractive options for preparing students for the workplace. Both teachers and students believe that game-based learning strongly improves ICT skills. Teachers also believe that motor skills, declarative knowledge and cognitive skills are strong outcomes, whilst their students beg to differ and rate social skills (collaboration and communication) as the next best outcome (Pivec, 2009). Collaboration inside and the social environment outside the game, encourage students to engage in activities. In some learning games, the surrounding meta-game contributes strongly to the learning, leaning towards role-plays, which can contribute to procedural and strategic knowledge (Pivec, 2009). Due to real-world knowledge and skills outcomes, role-play, however, is closer to a simulation than a game.

Motivation

Game motivational techniques include competition, goal setting, scoring, fantasy, surprise, uncertainty and relevance (Alessi & Trollip, 2001). Added motivation is the gathering of tokens or virtual money that the player must use to execute procedures, which lead to the development of decision making and critical thinking skills.

“Simulation makes it possible to maintain learner enthusiasm, like with games, and support real performance change” (Kindley, 2002). A computerised simulation also allows for the creation of a new learning culture that better corresponds with students’ current technological habits and interest and thus meets them in their familiar surroundings (Justice & Ritzhaupt, 2015; Rosen, Carrier, & Cheever, 2010). Students rather engage with computer-based augmented reality environments that they enjoy and find useful. The design of the interface contributes to the ease of using the environment, but is not the strongest determinant of their enjoyment (Wojciechowski & Cellary, 2013).

Pelser-Carstens and Blignaut (2018) found that students engaging with a board game enjoyed the social aspect of the board game most, followed by gaining subject knowledge, soft or technical skills, whereas group work with effective functioning was last. Carenys et al. (2017) found that accounting students enjoyed playing a videogame about particular content more than engaging with a comparable simulation. More important is the finding that the cognitive learning gains from the videogame and the simulation were equal (Carenys et al., 2017).

Fidelity

“Essential attributes of simulations include a model of reality defined as a system; a dynamic model; a simplified model; and a model that has fidelity, accuracy and validity” (Alessi & Trollip, 2001). Fidelity refers to how closely a simulation imitates reality, and affects the learner’s performance during the simulation as well as the application of knowledge to new situations. Fidelity provides context and aids understanding.

When distinguishing between students with different academic orientation, novice learners initially learn better from lower fidelity simulations that are less overwhelming, avoiding excessive stimuli (Alessi & Trollip, 2001; Huang, Johnson, & Han, 2013). An experienced learner or expert learns most during a simulation with higher fidelity, or a simplified model that is still perceived to be similar to the performance environment in key aspects. Such advanced learners achieve better transfer of learning if the perceived fidelity is high enough and they are suitably motivated, see Figure 1 (Alessi & Trollip, 2001).

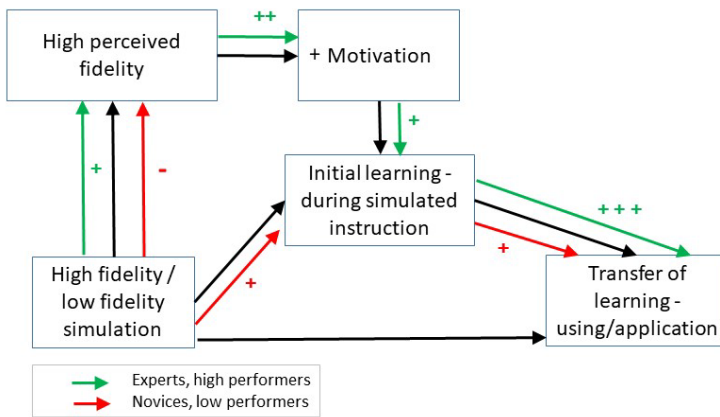


Figure 1. Transfer of learning through educational games and simulations: the relationship between fidelity and performance. Adapted from Alessi & Trollip (2001; p.235)

The enhanced Figure 1 shows the pathways for transfer to learning in a simulation. We superimpose the pathways for students with different skills and performance levels, with high performers marked in green (left of original direction arrow) and novices in red (right of original direction arrow).

Simulation games

A combined category (simulation games) display some characteristics of both games and simulations like competition, rules, winning and losing. Table-top board games are a good way of incorporating workplace (like accounting or tax) skills and learning the application of theory in the workplace in an undergraduate business course (Fouché, n.d.; Pelser-Carstens & Blignaut, 2018). Such learning games encompass real-world activities that enrich the classroom environment by supporting experiential and problem-based learning activities and encouraging learner-centred approaches and motivation to learn (Pelser-Carstens & Blignaut, 2018). In many simulation games student groups function as if in a real work situation rather than as competing teams. The main characteristics of a simulation game is presented in Table 1.

Table 1: Characteristics of Business simulation games

Characteristic	Business simulation game
Drill and practice, repetition	no /yes
Entertaining, fun	no / yes
Participants	collaboration and competition
Endpoint	sometimes / yes
Setting	realistic
Characters	real, role play
Motivation	fidelity & performance
Transfer of learning	more/ far

Student proficiency

Even though students have different preferences in learning (as also in music, food, etcetera), the most efficient way to learn is often not the one they prefer (Kirschner, 2017). We will argue that learning efficiency is a function of previous learning.

Vygotsky (1978), in studying how children learn, defined the zone of proximal development as those functions that have not yet matured, but are in the process of maturation. Vygotsky (1978) reasoned that the maturation process is enhanced when instruction involves *interaction* with peers and others who can help the learner proceed to the next developmental zone, as well as focus on learning that is just *ahead* of the developmental level of the learner.

Interaction in learning: Papert (1993) confirmed both points namely that children play together and learn together (point 1), and that children's motivation to persist in a difficult new game is due to their interest and the challenge it poses (point 2). Children quickly lose interest in games that are too easy and when tasks are boring, rewards will not increase self-motivation either (Deci, Koestner, & Ryan, 2001). Peer

learning in small group activities enable positive learning outcomes that can be observed and assessed (Biggs, 2014; Boud et al., 1999). Students who need support progress better with help forthcoming. Mastery learning based on the two sigma phenomenon (Bloom, 1984) confirms that one-on-one tutoring is the most effective way of learning and improving grades and using technology allows for targeted individual feedback, which is equally effective. Computer-based personalised learning pathways and adaptive learning tap into this principle.

Learning challenges: Like Papert, Boud argues for learning activities where students are in control. “Students gain more practice in communicating in the subject area than is typically the case in learning activities when staff are present. They are able to articulate their understanding” (Boud et al., 1999; pp.415-416). The difference in students who perform well and those who don’t, should be considered. The increasing numbers and diversity in university students require more non-academic support like learning the language of instruction, social integration and adjustment. Students also display diversity of academic commitment. Biggs and Tang (2011) describe this diversity. Academically committed students are motivated, knowledgeable and learn actively, which manifests in high grades. Non-academic students, often first-generation university entrants, might be unsure of goals, not interested in the subjects and taking a passive attitude to learning, resulting in poor grades (Biggs & Tang, 2011), and do just enough for a passing grade. Grades, however, is a poor motivator for learning (Deci et al., 2001). Biggs and Tang (2011) propose a change in teaching to reduce the performance gap, because when actively engaging the low performers in suitable learning activities, it will change their attitude and grades.

Are students with non-academic orientation doomed to perform poorly and not survive the workplace jungle? According to Vygotsky (1978) and Bloom (1984), no. The key is active learning, learning by doing (Schank, 2001), because it develops skills, adds to pre-knowledge (Merrill, 2002), which causes a student to progress on the continuum towards academic orientation and commitment (Biggs & Tang, 2011), and increases motivation for learning (Deci et al., 2001). Games contain all the characteristics needed to improve the performance of non-academic college students. They provide positive feedback and unexpected rewards that enhance perceived competence and thus enhance intrinsic motivation (Deci et al., 2001), while repeat playing increase skills and tacit procedural knowledge (Nickols, 2000-2001).

The value of simulations in education has also been contested. Wolfe (2006) believed that simulation games appear to be valid, but their effectiveness has not been proven.

Many claims for/against usefulness of simulations to achieve learning outcomes are based on affective perceptions of learning by participants and not on objective cognitive learning assessment (Clarke, 2009; Gosen & Washbush, 2004). Schank (2001), however, believes that the educational value of simulations has been proven.

Student and teacher perceptions were also at loggerheads with each other about what students benefited from simulations or games (Pivec, 2009). Empirical research consists mostly of examining student marks obtained in summative assessment, which in turn is designed to measure the stated, mostly cognitive learning outcomes. The grades therefore also reflect how well the teachers taught towards the stated outcomes. Such an approach therefore limits insight into what real value particular learning activities had for students with diverse personal learning goals. While exit level students need to develop different skills required by their future workplace (Neelen & Kirschner, 2018), the dots between those skills and the simulations are seldom connected.

- We *know* that the business professions require new integrated knowledge and skills outcomes that are not sufficiently taught at universities.
- We *know* that humans have an innate propensity for learning through play and exploration.
- We *do not know* how business simulation and games can prepare students across the performance spectrum for the workplace.

This brings us to the main research question for this paper:

- How do students with different levels of academic orientation perceive the learning resulting from the business simulation games, and how do those reflect the intended learning outcomes?

Context of study

The simulations were deployed in the Economic and Management Sciences faculty at the University of Pretoria, a large contact university that encourages blended learning. Both the first and third-year students were in the more challenging chartered accountancy / auditing stream of the bachelor of commerce. Selection criteria for this program are high, based *inter alia* on grades in mathematics and languages. Although recommended, accounting is not a prerequisite for selection, as many schools do not offer the subject.

The table-top board game, *Commercium*[™] (Fouché, n.d.) was developed in this country and simulated the roles and transactions performed by a professional accountant. The game aimed to familiarise first-year students with the practical context of the accounting profession, and was strongly recommended for the approximately 165 students who enrolled for this programme without having the necessary accounting knowledge. Most of these students participate voluntarily in this annual event on a Saturday two months into the academic year.

Each board could accommodate four teams of two students each playing against the other three teams, accompanied by a banker (a tutor). Each team received two inventory items to the amount of C\$10 000 each. The money and the inventories were their capital with which to begin their business. The game simulated real life transactions and the capital contribution was the first transaction to be recorded. The banker had to keep a bank statement for each team (consisting of two players). Students played for 12 rounds, competing with other teams in an effort to make the most profit. Afterwards students had to complete an assignment consisting of accounting documentation for marks. Table 2 presents the objectives of the board game.

Table 2: Board game objectives

Outcomes: classification	Intended learning outcomes
knowing	Describe the accounting cycle as a whole; Give a broad description of the functioning of the business environment and the general economic environment;
doing	Analyse transactions and be able to record them on source documents from practical scenarios; Record source documents in the subsidiary journals; Post subsidiary journals to the general ledger; Prepare a trial-balance, Statement of Comprehensive Income and Statement of Financial Position from the general ledger;
being	Communicate in a business environment; Work effectively in groups.

(Source: <http://simertraining.co.za/Commercium/>)

The web-based audit simulation was a compulsory component of the blended learning for the 601 third-year auditing major students. The simulation was developed and hosted overseas, and used per licence. The simulation has been designed to help students grasp various aspects of financial auditing by actually going through the audit process – learning by doing. Students play the parts of audit team members, working for a firm called AG Financial Services. They had to conduct an audit of a company named Sheridan AV. This required performing audit procedures on the financial

documents of the business, going through processes similar to the work of real-life auditors. GM, the virtual auditor team manager provides tasks, documents and other resources at appropriate points in the simulation. Students could find any relevant information on their client on the simulation website. The simulation activities were rolled out at the beginning of the academic year and continued over several weeks. Students were awarded marks for completing key documents.

Only 20% of these students indicated that they play computer games, which does not echo student profiles elsewhere in the world (Huang et al., 2013).

Figure 2 shows the spread of students across academic performance in the two groups.

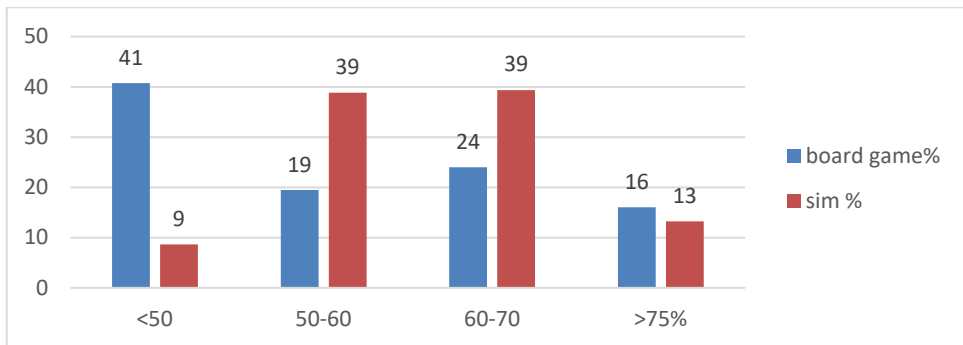


Figure 2. Distribution of student academic performance in the two classes

Methodology

A mixed methods study was performed on data collected using two electronic surveys hosted in Qualtricstm and linked in the students' online classroom. A hundred and eight first-year students who participated in the board game completed the survey in the year of the study, containing two questions that were analysed. In the first question they could select any one or more of five given statements. An open-ended question also invited them to describe the single most important benefit of the game. Responses were grouped into self-reported performance brackets, the distribution in the two courses is shown in Figure 2. Content analysis using Atlas.tiTM was applied to the anonymous qualitative board game feedback, coding and grouping codes according to themes.

From the 601 third-year students, 371 completed the questions in this study. Responses were grouped according to student grades in the subject prior to doing the simulation. Descriptive statistics are presented of the responses that were weighted

according to the 5-point Likert scale (1 = *strongly disagree* – 5 = *strongly agree*). Ethics clearance to use the data for research was obtained by the respective lecturers of the courses.

Findings and discussion

Board game played by first-year accounting students

Board game itemised question

The question was the following: Please tick all the boxes that describe your experience of the Accounting Board game – (you can tick more than one). Responses were grouped according to the student grades they reported at the time. Figure 3 shows the percentage of students in these groups who selected each statement.

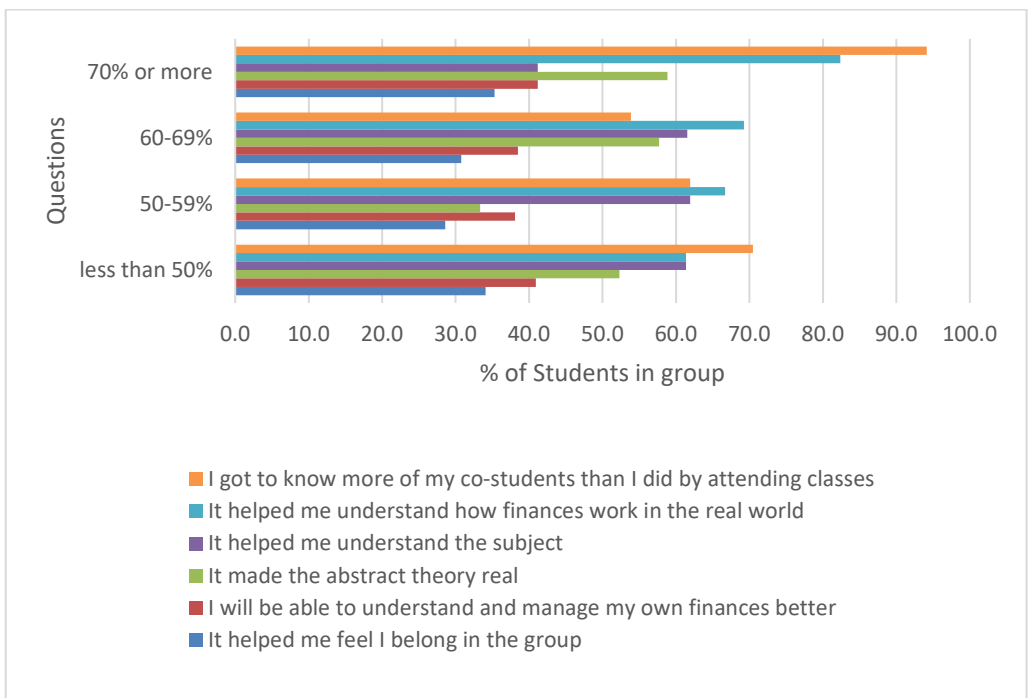


Figure 3. Experience of the Accounting Board game by academic performance: statements chosen.

In the table-top board game, getting to know their co-students obtained the highest mean rating by the class, selected by 68% of all participant students. Understanding how finances worked in the real world, was the second most popular statement of how students experienced the board game. Chosen by 94% and 82% of the 70+ students,

those two were by far their top statements. Between 54% and 70% of the rest of the class chose the first item and 61% – 69% the second one. With 58% of the whole class selecting *better understanding* of the subject as overall third, it only attracted 41% of the 70+ students, while around 60% of the other students ticked this box. The simulation made abstract theory real, according to 51 % of students. There was likewise no great variation among groups (mean 39.8%) in how they learnt to understand and manage their own finances. The lowest rating was found in how the games *helped them feel they belonged in their groups*, varying between 28% and 35%. Considering the diversity of the class, not choosing their own team mates, and competitiveness between teams could contribute to this lower rating, in spite of students getting to know everybody.

Board game open-ended question

The responses of students with different levels of academic performance were coded qualitatively into 25 codes, and grouped into five themes, as shown in Figure 4. Some of the general comments made by students about the game day include: interesting, extremely fun, exciting, informative, a summary or overview of how enterprises operate. They “got experience of actual transactions. It made accounting seem real”. About working in groups: “since we were competing with the other group one had to always be on point by strategising, learning from the other group and assisting each other where needed. Since we had never spoken to each other it has increased our network of friends”. They mentioned competition, team spirit, rewards. Unintended outcomes included: “now I am assured that I chose the right course”. The open question was: In one sentence, what was the most important thing that the Accounting board game helped you with?

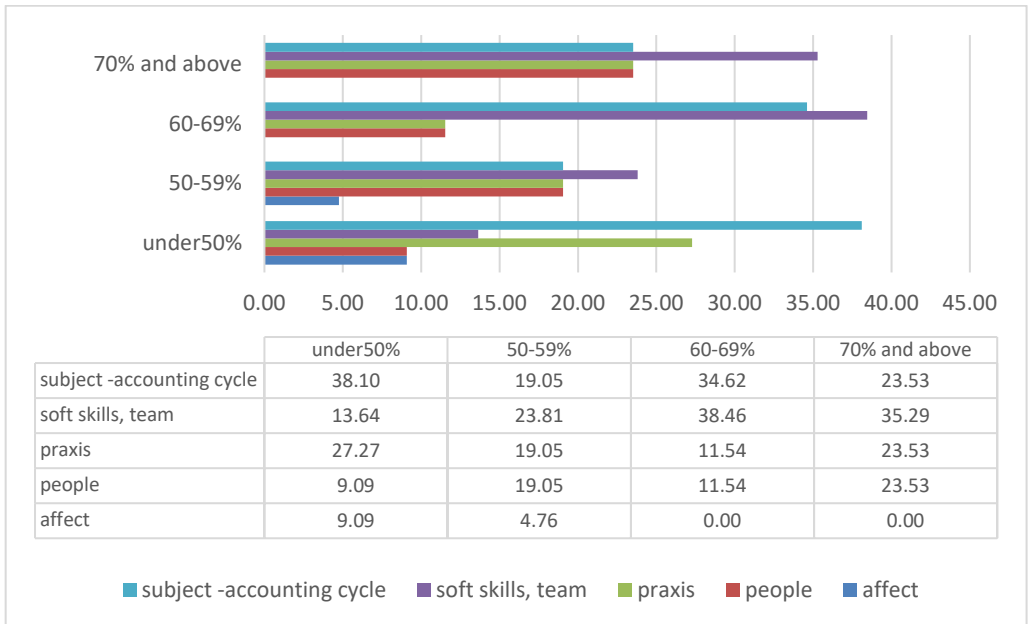


Figure 4. Describing the most beneficial outcome of the board game: Themes from content analysis in performance layers represented as percentages

Figure 4 shows the performance segments on the vertical axis and the % of first-year students nominating benefits of the board game on the horizontal axis. Those codes were grouped into the five themes as shown in Figure 4. There was great variation in how students experienced the benefit of the accounting content or how it related to the real world represented in the board game. The under 50% students (the largest group) found the content-learning aspects most beneficial, and more so than any other group, showing how effective a representation of an unfamiliar, though real concept is to establish a knowledge base. The importance of application in practice varied greatly between groups, but its salience was either similar to subject content, or lower, showing that their working life was still distant in the future. The combined soft skills, that encompassed workplace related skills, teamwork, understanding people and affect for the subject, shows an increasing trend as marks increased, with nearly 60% of the top-performing students describing one of those skills as the greatest value gained from the board game. This is consistent with students with academic orientation already displaying intrinsic motivation including affect of learning.

Comparing the findings from the quantitative and qualitative questions, confirmed the importance of the social and subject content themes. While the lower performing students found all aspects of the board game valuable in the quantitative items, they

singled out understanding content as the most beneficial to them in the qualitative feedback. Conversely, the highest performing students did not find the content related facets (*understanding*) particularly valuable, signifying a better pre-knowledge of the subject. The social and soft-skills aspects of the board game that was unique to the delivery mode, was important to the whole class, and this became more pronounced the higher the students' marks were, strongly evident in qualitative and also suggested in the quantitative question about getting to know their peer students. Notably, group and team-related activities were seldom rated as the most beneficial aspect of the game, possibly showing that most students did not know anybody well at this early stage.

Audit simulation – findings by knowledge levels

Simulation – responses to scaled questions grouped by five themes, compared by academic performance

After the online audit simulation, students completed the questionnaire containing thirteen questions that directly related to the online simulation. The questions were grouped into five themes and the average rating for each calculated (maximum rating being 5), broken out into the same performance categories used for analysis of the board game data. The *subject* knowledge theme had a high average rating that increased among the lower performing students. Figure 5 shows that most elements of the simulation were perceived more positively by lower-performing students than particularly the highest performing ones, particularly affect (enjoyment of the simulation) and subject understanding, increasing with lower grades. The lower performers were also more positive about the simulation, a multifaceted theme unique to the online delivery mode (online feedback, clear presentations, appropriate media and learning more than in traditional classes). Contributing to the simulation theme, students rated the use of media as highly appropriate. *Praxis* (learning about the audit process, insight into real life audit, putting classroom theory into practice) was overall the most beneficial contribution of the simulation, as was the intended objective of the simulation. *Soft skills* referred to professional skills, discussions with the group, decision making and open discussion, and were well and uniformly represented. The *praxis* and *soft skills* themes represent transfer of learning that could have been affected by perceived fidelity of the simulation and resulting motivation (Alessi & Trollip, 2001; Huang et al., 2013).

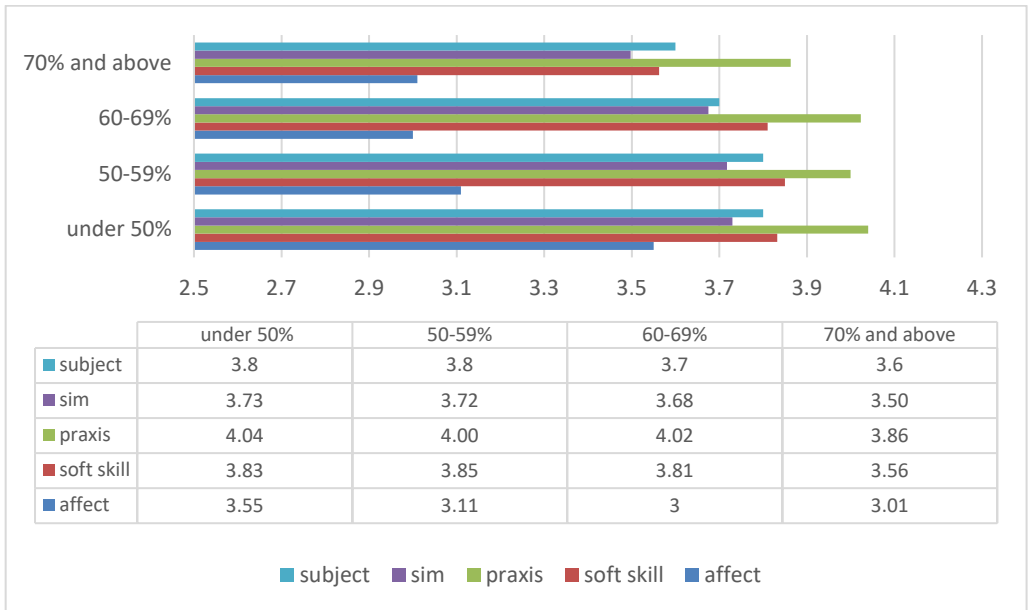


Figure 5. Themes grouped from scaled items on simulation, portrayed by performance levels

Comparing themes across simulations

The board game in a face-to-face setting was above all successful in allowing students to know each other and developing soft skills and teamwork, particularly among the top-performers. Transfer of knowledge to be used in real-life practice was second for all students, with better understanding of the subject being important for lower performing students. In the web-based simulation the subject knowledge component was generally only third in importance. The transfer of knowledge to workplace practice was the top affordance of the simulation for all students, falling in line with research by Carenys et al. (2017), finding that online simulations are more effective than games in transferring skills to the professional world. This is not surprising, considering the higher fidelity perceived in the online environment that could increase motivation to participate and increase learning during the simulation that could lead to higher transfer of learning (Alessi & Trollip, 2001). The affect increased in lower performance groups in both the board game and the online simulation, and was more prominent in the online simulation (Figure 5) than in the board game (Figure 4). Affect could have had a positive effect on motivation and hence transfer of knowledge, making this an important component of an online simulation, therefore the relationships between performance and fidelity on Figure 1 (shown earlier) is relevant to this study.

Conclusions

In a holistic picture of two simulations in the same field, some tentative generalisations can be made. For students on the lower performing layer of a class, it seems that both the board game simulation, as well as the online simulation was valuable in understanding the subject better, more so than for students who were already performing well. This confirms the importance of pre-knowledge on subsequent learning and performance (Merrill, 2002). The higher performing students gained valuable acquaintance with peer students in the board game, a unique affordance of the face-to-face mode of interaction, in line with the report by Pivec (2009), that students perceived gaining social and communication outcomes from games. The lower performing students enjoyed the online simulation more than the high-performers, confirming the higher levels of affective learning in a game that resulted in better motivation. They also evaluated the web-components more positively than the higher performers, also tied up with affect.

The third-year students as a group found the most value in the theory-praxis aspect and learning about the professional process, signifying far transfer of learning. The praxis in the board game was not perceived as vividly, having a lower fidelity, but was more enjoyable, affect and motivation being one of the strongest characteristics of a game. Transferring learning to the workplace, was achieved equally well for lower performing, *novice* and expert, high performing students, signifying that the simulation's fidelity was pitched at an appropriate level, and were sufficiently motivational to aim at far transfer of learning.

Incorporating simulations have benefits for educators. "The majority of students, irrespective of ICT adoption profiles, their gender or population groups agreed that the learning value of an online simulation was more beneficial than traditional teaching methods" (Beukes, Kirstein, Kunz, & Nagel, 2017). Both simulations, one containing game elements, and an online simulation of practice, successfully achieved their respective aims regarding the subject and theory-praxis bridge, while also achieving extra-curricular outcomes emanating from their delivery mode (contact or online), and were suitable for the respective academic stage of the students. Both simulations particularly supported the lower-performing students with understanding subject concepts and motivation, paving the way towards a more academic approach to learning that will prepare them better for the jungle called the workplace.

After running for several years, a new Accounting board game on the same principles is now being played, as compulsory activity for every student in the class.

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Communication and Interaction in a Blog-Based Learning Space

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Abstract

This study is an exploratory case that follows one course offering in an attempt to trace the way the space either constrains or enhances communication and participation in an open, online course offered using a variety of social networking tools. As social technologies are designed with an “architecture of participation” how the learners use the spaces afforded to them, to both communicate with each other and engage with the learning content were examined. Content and structural analysis were conducted of blog posts and comments using a modified coding scheme based on the Community of Inquiry (CoI) model to look for patterns of participation and cultural production. In this case, participation patterns demonstrated that individual engagement with course content and activities was favored over collaborative engagement with fellow learners. Though the course learners were willing to participate and share in developing a learning culture that was supportive, engaged, and open, in the end the demands of formal academic writing, the performative elements of the “post”, and the barriers imposed by the virtual space may have hampered their ability to sustain active levels and patterns of participation and engaged discourse..

Keywords: Learning spaces, networked learning, social technologies

Introduction

Formal online learning often takes place in highly structured learning management systems (LMS) or virtual learning environments (VLEs) that are designed to manage, in one space, all of the materials and resources learners need to participate in a course. The use and integration of social or Web 2.0 technologies such as wikis, blogs, and social media, into educational practice has been increasing as instructors try to design more open, participatory environments. What defines these tools is their ability to make the digital practices accessible and participatory, and their focus on creating social connections between users, in what O’Reilly (2004, as cited in Hemmi, Bayne, & Land, 2009) terms an “architecture of participation”. The ability for learners to create, remix,

interact and participate in digital cultures is attractive to educators who follow contemporary socio-cultural pedagogies (Bayne, 2010). As these social technologies are co-opted into educational practice, they redefine the spaces where learning takes place, and new cultural, pedagogical and social practices will emerge or need to be developed to inhabit them.

Goodfellow (2008) adopts Gunawardena's (2003) definition of culture to be, "A system of knowledge, beliefs, behaviours and customs shared by members of an interacting group, to which members can refer, and that serve as the basis for further interaction" (p.556). Using this interpretation Goodfellow and Hewling (2005) argue that virtual learning environments can be seen as places where social and cultural production processes occur in their own right, encompassing not only the visible interactions and negotiations of communication, but also a range of activities that also include invisible factors mediated by background technologies, institutional policies and practices and wider discourses on online learning. In addition, Gunawardena, Frechette, and Layne (2019) suggest that as online digital cultures can be as real as analogue ones, and because they allow ideas to cross spatial and temporal barriers, they can also generate new cultural norms. Hewling (2009) also emphasizes that technology, due to its unpredictability and interactive relationship with the different elements of the learning environment, is an important cultural player and should be a factor that is considered in examining these systems.

If the learning spaces created using social technologies are impacting on the learning culture, through ways that can redefine pedagogical practices, social interactions and institutional norms, how do we start to explore them? Particularly as we co-opt social technologies into our online teaching practice to open up boundaries, do they support an "architecture of participation" and how do learners use these spaces, to both communicate with each other and engage with the learning content?

This project used methods to look at both historical traces of activity (visible messages) and the "physical" course structure (technology/content) to consider the following research questions:

- What effect does the learning space have on the learning culture in an online course?
- In what ways does technology act as a barrier or enabler for learner's interaction/communication?

- How does learning in an open space shape the communication practices and participation in the course activities?

Examining Learning Spaces

When we examine our processes and practices in networked learning, the conception of the learning space itself is often overlooked. As Chism (2006) points out, as educators “we often fail to notice the ways in which space constrains or enhances what we intend to accomplish” (p.2.3). Most research that implicates space has focused on traditional F2F classrooms, and little attention has yet been paid to the learning spaces in virtual or online environments. Bayne (2008) points out that current studies have generally been focused on instrumental functionality and affordances, rather than an exploration of how the VLE can define the information and pedagogic practice. MacFadyen (2006) states that “the places and spaces of the Internet, its landscape and the beings that occupy it, are constructed and represented almost entirely through text” (p.5) and as Dodge (2005) highlights, the spaces that define computer-mediated communication are often relational and difficult to visualize and trace. In these virtual spaces how do we begin to explore both the text-based, visible practices and the more invisible patterns of social interactions that occur?

The traditional LMS or VLE adopted by higher-education institutions, either corporate (Blackboard, Desire2Learn) or open-source (Moodle), are often characterized as being inflexible, “walled-in”, and closed (Godwin-Jones, 2012). They are usually password protected, boundaried to other web applications and people, rigid in their structure and navigation. As Godwin-Jones (2012) points out they offer uniformity and stability, preferred by IT support structures and institutions, but offer little in the way of technological literacy for students in an increasingly digital world. In her visual analysis of one LMS, Bayne (2008) concludes that the characteristics of stability, hierarchy, continuity and conservatism, leaves little room for teachers or learners to construct creative pedagogies that interact with current digital technologies. On the other hand social technologies are characterized as being open, distributed, collaborative, networked and user-defined (Hemmi et al., 2009) and as Potter and Banaji (2012) point out there is a “raft of enthusiasts” exploring their uses in new participatory cultures and literacies.

One type of social technology that has been widely adopted in educational practice is the blog. As Jones and Alony (2008) point out, they are often a type of personal online journal that links to other blogs and topics, often other bloggers, and these

interconnections create what is known as the *blogosphere*. Blogs have a capacity to allow for both self-expression and social connectivity, and past research has shown that introducing blogs can support self-directed learning (Roberston, 2011), facilitate discussion (Ellison & Wu, 2008), reflection and emotional expression (Deng & Yuen, 2011) and support feelings of community and belonging (Top, 2012). Other studies though, such as O'Donnell (2006), highlights gaps identified by educators between expected versus actual outcomes of blogs and identify drawbacks such as poor facilitation of discussion, technological barriers, assigned blog writing being “forced” and too high a focus on the personal (p.10). Deng and Yuen (2011) found that blogs are mainly a tool for personal broadcasting, and though they were valued for their social facility, they only supported a limited degree of social interactivity and potential for extensive and dynamic dialogue.

Hemmi et al.(2009) reported that social technologies when co-opted and repurposed for formal teaching provided means for collaborative modes of inquiry, group self-regulation, and self-explanation but that they perhaps sit uncomfortably, are “strange and troublesome”, within traditional higher education practices. Saadatmand and Kumpulainen (2012) found similar results as learners in Open Networked Learning Environments reported that though the introduction of many tools and choices in activities was motivating and engaging, it was also disruptive and time consuming and required a high level of technological competency. Gunawardena et al. (2019) point out that technologies also have cultural assumptions built in, and digital tools often reinforce existing imbalances of power, cultural biases and values about knowledge. In addition, educators rarely have choice in what technologies are available to them, and even if they do, the technologies themselves may not meet their learning and teaching needs. As Collier & Ross (2016) point out there is still an uncertainty and messiness that we face in using these emerging technologies, a sense of “not-yetness”, and there is a need to explore these spaces from a learning context, examining learner perceptions of their use and how we as educators can more effectively incorporate them into our practice.

Methods

Study Context

This case examines an open, online course in a post-graduate certificate in online teaching and learning. The courses in this programme are directed to both K-12 teachers and post-secondary teachers interested in bring learning technologies into their classroom practice or offering courses in an online or blended environment.

The course design draws on social-constructivist philosophy, where learners are critical, collaborative, and creative participants in the social construction of knowledge. One of the goals of the certificate is to provide educators with the technical and pedagogical expertise to use educational technologies, so learners are encouraged to explore social technologies so they can critically assess and reflect on their use for their own practice. As a traditional commercial Learning Management System (or VLE) might impede the integration of personal content and Web 2.0 tools, an open-source system (WordPress MU) that could be adapted to provide a more flexible learning space was adopted.

The course blog site consists of the course content, space for instructor posts, and links to student blogs. Each week's activities consist of student blog posts on their personal blog sites, and include responses to questions/readings, collaborative small group projects and reports, creation of media or other teaching materials, reflective writing or other. Assignments and a final project are also posted to the blog, and students are encouraged to explore and use a variety of different social technologies in their exploration of the course topics. In this offering, seven participants enrolled in this course, but as a few of the students in this course were enrolled in multiple courses, there was evidence of *cross-cohort* communication between the courses.

Methodologies

A case study approach was chosen as cases have been shown to “investigate and report the complex dynamic, and unfolding interactions of events, human relationships and other factors in a unique instance” (Cohen, Manion, & Morrison, 2007; p.253). As exploration of online spaces, particularly ones that are open, networked, and socially connected is still in its infancy, the methods and frameworks are still relatively underdeveloped and exploratory and many social-science and educational researchers have called for new approaches (Browne, 2003; Hine, 2017). To explore both the visible and invisible processes at work in virtual environments, this project used a modified virtual ethnographical approach (Hine, 2005). Open and accessible historical web-based content were explored using, a modified form of web-sphere analysis (Schneider & Foot, 2005) combining both content analysis and elements of structural analysis of the linked course website.

As one of the aims of the project is to determine whether or not students were developing a learning culture, evidence of interaction and cognitive engagement in the online spaces was sought. Various models for analysing asynchronous communication were examined. A Community of Inquiry (CoI) scheme (Rourke, Anderson, Garrison,

& Archer, 1999) adapted by Heckman and Annabi (2006) was adopted to explore cognitive and social practices and interaction evidence, but as limitations were encountered after initial analysis, was expanded to include issues around technology and elements of discourse responsiveness called “communication and common ground” from Xin and Feenburg’s (2006) framework for “engaged collaborative discourse”. As the intent of this paper is to trace the elements and development of practices and determine how the learning space was thought to be a factor influencing the development of communication norms, the coding that emerged borrowed elements from different frameworks.

Data Collection and Analysis

A total of 91 student posts, and 11 instructor posts were added to the course space over the term. As activity over time was an important consideration, posts, associated comments and media from weeks 1, 3, 7 and 11, which provides evidence over the duration of the whole course, were collected and then coded using a combination of the predetermined categories and emerging themes. A total of 38 blog posts and their associated media (video/audio), and 61 comments were coded using Atlas Ti. All student content was anonymized.

The course space was examined to look for linkages and patterns in course communications, and to determine what design factors might impact on the ways that course participants communicate. The space was explored intuitively, and though structural/feature analysis methods identified by Schneider and Foot (2005) such as number of pages, hierarchical ordering, and linking were examined, other structural elements such as flexibility (integration of content/media, visual design), “physical elements” (posts/comments length, location, connections), and spatial relationships (communication, site elements and configuration) were explored for effect on communication and interaction patterns.

Ke and Hoadly (2009) point out that one of the limitations of researching online communities is that the data collected are limited to the online activities. In this case, the interactions of learners outside the course space (in other social tools such as synchronous chats and social bookmarking sites), and those with the course instructor, are missing. Further data, such as interviews with instructors and students would provide more insight into their perceptions of identity, reflections on the influence of the learning space (open/closed, formal/informal) on cultural processes and perceived benefits/drawbacks of using social technologies in formal educational settings. The cohort size of seven, as well as the course content’s proximity to the

subject being studied, also limits the studies ability to be generalized, but it does provide novel insight into the methods used to explore social technologies as course delivery platforms.

Findings and Data Analysis

Structural Analysis



Content

• LOGIN/FEEDS

- Log in
- Entries RSS
- Comments RSS
- WordPress.org

• OUR COURSE

Open all | close all

- Week 1/2 - Voicethread
- Week 2 Wrap-Up and Week 3
- Week 4: Assignment 2
- Week 5: Learning Theories
- Week 6: Learning Theory in ..
- Week 7: A personal theory
- Week 8: Planning
- Week 9: Assessment and Eva
- Week 10: Authentic Assessm
- Week 11: Online Assessment

Instructor

Week 1/2 – Voicethread

Update: January 26th

Thanks everyone for the great posts so far this week. Thanks to [redacted], W [redacted], B [redacted] and [redacted] for your ideas and thoughts on PIPA/SOPA – it is great that you have taken this idea and have further explored it, contemplating the implications and issues for a DL and TEL environments. I put a link on a few early posts – if you are interested in the OER movement, creative commons licensing and other issues around creating and using OERs, the OER foundation is hosting an online workshop called, “Open content licensing for educators 2012-01” that started Monday. There are over 1000 people enrolled from around the world, so if you are interested in some of the discussions or resources here is the link: http://wikieducator.org/Open_c...tors/About

The concept maps and posts on the history of DL are fantastic, and it is always amazing to me to see how your personal context helps shape the way you link the different ideas and definitions together. As you are finding, there is no one definition – what you find to be most meaningful will likely match your current context, where

Student

To search, type and hit enter

RECENT COMMENTS

- on Readings and Activities: Authentic Assessment
- on Readings and Activities: Authentic Assessment
- on Readings and Activities: Authentic Assessment
- on Readings and Activities: Authentic Assessment
- on Readings and Activities: Authentic Assessment
- Questions and Help

RECENT POSTS

- Assessment and Bloom’s Taxonomy
- Assessment vs Evaluation

the EDDL 511 Resources section.

Go to the [LearnNow BC](#) website. Go to the educator resources section of the website to search for their definition of Distributed Learning and read about how DL works in the K-12 system in BC.

Kathleen Matheos, and Walter Archer. (2004). *From Distance Education to Distributed Learning Surviving and Thriving*. *Online Journal of Distance Learning Administration, VII, 4, State University of West Georgia, Distance Education Center*

<http://www.westga.edu/~distance/ojdl/winter74/matheos74.htm>

Conduct a search for a few more articles on the history of distance education that focuses on your own content (K-12, post-secondary or something else) that may fill out some of the gaps you have found in the other readings.

Activities | Description of activity

1. Create a concept map for all the different terminologies. You may have to do a bit more research into some terms that you have not yet encountered. Post your map on your blog (or link to it) and discuss the following:
 - Is there a broad definition of DL that encompasses other commonly used terms and definitions? After your research this week, what is your definition? Has your interpretation of what DL changed? Comment on at least two other posts.
 - Is there a difference in DL terminology that is linked to different educational contexts? Do you think this distinction is important?
2. Map the relative historical context for DL as a field, or in your current educational setting. Where did it start, where are you now and where do you see it going in the future? Are there barriers to moving forward?

BLOG

Students complete activity and post to their personal blog

Week 3 Activity 3 November 18, 2012

BLOG

Online Assessments November 18, 2012

Technology Enhanced Unit Design November 18, 2012

Bloom's taxonomy: Revised and Digitized November 18, 2012

Figure 1. Blog structure on the main course blog

The structural analysis highlighted some of the difficulties students would encounter when trying to interact with both the content and with each other on the course blog.

- To interact with activities or each other students need to visit multiple spaces (the course blog, their own blog, and other students blogs, other tools/spaces see (Figure 1). Based on student feedback many found this disorienting and confusing.
- The current course configuration is not optimized for displaying images and other embedded content, providing flexible organization of posts (other than chronologically) or providing structured space for extended discussions. Many non-textual items did not fit within the *space* and were difficult to engage with in a meaningful way.
- Posts are privileged over comments, unlike in threaded discussions where users can add new topics, in a blog the post takes up a central space, and comments are relegated to the bottom and are often hidden. Potter and Banaji (2012) characterize blogs as *performative* spaces where students are productively engaged with words, images, sounds and making connections. It characterizes the blog

space as an individual rather than collective space. Of note is that the average post was 350 words, and comments 100 words.

- Figure 2 provides a visual representation of the types of interactions that occur in one *discussion activity* in this course. The disconnected and disparate spaces create a pattern of discourse that is *one-to-many* that not only focuses on the individual and not collaborative processes, but may also allow for conversation threads to be lost and abandoned.

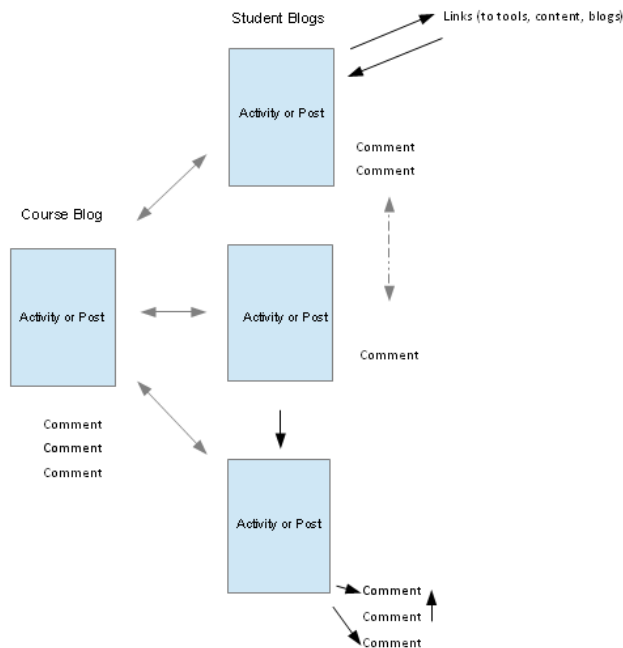


Figure 2. Participation Pattern for Blogs

Content Analysis

In the first week student communication focused mostly on social processes and particularly on establishing identity (see Table 1), which MacFadyen (2009) and Hewling (2006) identified as integral to the establishment of learning culture. Of the 74 entries recorded in the first week, over 40 were concerned with establishing identity, either through self-disclosure, sharing of educational or professional experiences, providing salutations or setting the climate for the course. All posts contained a photo, personal or of family, and many presented details of life outside the

educational experience. There was evidence of customization of personal student blog spaces, with different themes, organization, tagging, and links to other sites.

Table 1: Participation patterns by week

Week	Blog Posts				Total	Comments			
	Total	Social Processes	Cognitive Processes	Teaching		Social Processes	Cognitive Processes	Teaching	Technology
1	14	8	7	2 (1, 1)	60	56	8	17 (7, 10)	14
3	9 (2*)	1	7	2 (1, 1)	17 (1 outside expert)	15	6	7 (3, 4)	4
7	6	0	6	1	13	12	11	4 (2, 2)	1 (instructor)
11	3	0	3	1	2	2	2	0	

* Collaborative Posts

For some learners technology use was also a way to establish emerging online identities, for example using an animation tool to add gestures, movement, and humour into their online introductions, moving away from text to a more *embodied* sense of self. Those learners newer to technology, responded with admiration and support, and these early adopters developed an early cultural practice of “bringing technology in” to the course. In week one, 20 posts/comments were concerned with technology, either about introducing new tools, discussions about the best uses of tools to help in teaching, as well as self-organization and study, and a majority of the learners participated in these discussions, including some from other courses in the program. In the first week an active community is emerging, sharing experiences, particularly educational and professional.

By week three new patterns emerge, as students spend more time engaged with the cognitive processes and less with social processes. 7 of 9 posts are related to cognitive processes, with these focused on course content and activities, which is to be expected. The learners use the comments for social check-ins (rather than making a post) and so combine the social processes of complimenting, referring, and encouragement, as they also engage with the intellectual content in the post. In this stage and beyond, patterns outlined in Xin and Feenburg’s “engaged collaborative discourse” might be expected, as learners move to deeply examine the course concepts. At this point however, the emerging learning culture shifts somewhat, and the structures imposed by technology perhaps start to impact on practices.

By week three there is evidence of strong cognitive engagement within the blog posts. Of the three main categories of cognitive presence identified in the CoI model, the posts represent a high level of intellectual engagement, as all were coded as either

analysis or integration. The posts consistently use traditional formal academic writing, which includes evidence of consideration of course concepts, reflection on professional practice, and integration of resources and academic references. At the same time, the responses to these posts are mostly exploratory (rote factual responses and information exchange) which are at a lower engagement level. At this stage of the course, you might expect that the discourse would proceed according to Xin and Feenburg's (2006) process of intellectual engagement and communication, which has three stages: topic initiation, multi-logue, and common-logue. In the initiation phase a topic is introduced and participants respond with their perspectives, thoughts and ideas. In the multi-logue the discussion moves beyond clarification or sharing approaches, to convergences of opinion, with participants agreeing and disagreeing, clarifying or elaborating, reflecting, justifying or putting forth solutions. In the common-logue the group should work to a consensus or decision through synthesis and integration. In this case, the posts act as topic initiation, and though most comments start to move into the multi-logue stage (they offer points of agreement, elaboration, reflection and justification), there is often no follow-up or further engagement beyond this. Of the 20 comments coded for *prompting* which was used to identify comments that would function as a way of "furthering the conversation", less than half received an answer. So though there is a high level of intellectual engagement with the course topics, these are mostly at the individual, rather than the community level, and collaborative engagement within the course environment decreases.

In week eleven there are only two posts, which is a dramatically decreased level of engagement. This could be attributed to many factors (fatigue, as this week follows the submission of a major assessment, lack of engagement with the course topics, or other), but lack of engaged collaborative discourse might be one. In the final week, all students contributed a final reflection and post, and most expressed enthusiasm for the overall learning experience, as well as support for each other's contributions, so a return to the cultural practices established earlier in the course (support, encouragement, engagement) is in evidence.

The student questionnaire feedback supports the findings above. Though overall, the students rated the course structure and learning activity design positively, many indicated that it was very time-consuming to visit every student blog, there was not enough collaboration, and suggested a need for a central space for discussion. They also commented that inconsistent participation from other learners made it difficult to participate in some of the collaborative activities. As one student claimed "there is still

a need for tools for activities for collaboration and presentations – we had many disjointed things happening in many places and most tools had weaknesses.”

Discussion and Reflection

Though social technologies are embraced by educators for their ability encourage participatory, collaborative and creative pedagogies, they can also provide barriers to the very processes and practices we want students to embrace. In this study, the learning space shaped the participation patterns in such a way, that individual engagement with course content and activities was favoured over collaborative engagement with fellow learners. The blog postings all showed a high level of cognitive engagement with the course concepts, and often followed a more formal academic writing format. As Hemmi et al. (2009) point out “the use of new digital media does not necessarily, it seem, determine new ways of writing or being within academic programmes” (p.27), particularly when they are embedded within the formal structures of the institution which requires formal assessment and evaluation of student work.

In this case it was evident early in the course learners were willing to participate and share in developing a learning culture that was supportive, engaged, and open, but in the end the demands of formal academic writing, the performative elements of the post, and the barriers imposed by the virtual space may have hampered their ability to sustain active levels and patterns of participation and engaged discourse. This seems to contradict the notion that social technologies support an “architecture of participation”, and in co-opting social technologies for use in formal learning, there is a risk of recreating the rigid structures and hierarchies of the bounded and “walled-in” spaces of more traditional LMSs. If the LMS/VLE is the “nexus of social and cultural” processes then educators need to pay close attention to not only what is happening, but how the space can constrain or enhance what can be accomplished. To develop innovative pedagogies that embrace the capabilities of social technologies, further research will need to focus on the interrelations between what Hewling (2009) terms “all the players” in the online space – technological, social, and cultural – to establish an ideal configuration.

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Beyond the Cover-Story: Unpacking the Place of Open Textbooks in Irish Higher Education

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Abstract

While digital technology in some form now permeates most conventional campus-based courses the truth is that textbooks remain a fixture of the higher education landscape. Moreover, rising textbook costs are an often unspoken reality of the student learning experience, particularly in North America. Less is known about the costs and usage of textbooks in Europe and more specifically the emergence and potential impact of openly licensed digital books. This study seeks to address this gap in the literature, with a particular focus on the Irish higher education context. Framed around five overarching research questions the research aims to (a) complete an environmental scan and national baseline survey of open digital textbooks Ireland; and (b) undertake a micro-level institutional case study of current practice around the use of textbooks and adoption of open digital textbooks more particularly. The wider objective of this line of research is to help inform and eventually develop or at least pilot an Irish open digital textbook initiative. Although the study is still at an early stage in the research process a critical perspective anchors and guides the work as we seek to better understand the transformative advantages of open digital textbooks. Put another way the longer-term intention is to go beyond efforts to merely replace traditional print-based textbooks with cheaper and more accessible open digital learning resources, as we wish to challenge the basic conception of the student as the audience of such materials.

Introduction

This paper reports a work in progress to investigate the current and intended future use of open digital textbooks in Irish higher education. It begins by establishing that open digital textbooks, as a subset of the wider Open Educational Resources (OER) movement, have not featured prominently in Irish higher education policy texts. A brief synthesis of the literature reveals the strong North American influence driving innovations in open digital textbooks over the past decade, particularly in response to

increasing concerns about rising costs. The research problem is framed by a gap in the literature and aims to go beyond anecdotes and cover-stories to instead gather firm data about textbook use in Irish higher education. More specifically the study aims to establish current and intended future usage of open digital textbooks. Five research questions that guide the study are then outlined along with the methodology for the first two parallel work packages: (a) an environmental scan and national baseline survey of open digital textbooks in the Irish higher education sector; and (b) an institutional case study of current practice around the use of textbooks and adoption of open digital textbooks more particularly. The final work package aspires to develop an open digital textbook initiative based on findings from earlier phases and the international literature. While the study is still at an early stage a critical perspective underpins the research as we seek to better understand the potential transformative advantages of open digital textbooks over and above the use of more conventional learning resources.

Background

Despite textbooks still being a common feature of the higher education landscape in many countries the open digital textbook movement has not yet featured prominently in Ireland. Finding little or no explicit reference to open textbooks or open digital textbooks from a systematic search of major Irish policy texts evidences this claim. The term *textbook* for example does not occur frequently ($n = 3$) in the “National Roadmap for Enhancement in a Digital World 2015-2017”, with the statement, “We will cut costs by going digital” with our textbooks’ appearing in a section under the myth of diminishing costs (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2015a; p.7). More recently an Irish case study of open education policy initiatives, which is part of a wider European report describing open initiatives in 28 EU countries (Inamorato dos Santos et al., 2017), supports the view of a gap of policy-related activity in this area, as no reference is made to open textbooks.

On a related note, Ireland also stands out alongside of Latvia, Luxembourg and Slovenia in this European Commission report as the only countries not to identify MOOCs in the context of open education policy initiatives. The absence of the MOOC movement in Irish policy texts remains an intriguing gap, especially given the Government’s current focus in the “Higher Education Systems Framework 2018-2020” on promoting flexible life-long learning (Ministry of Education and Skills, 2018). Notably, in 2017 the growth of MOOCs continued worldwide with an estimated 78 million learners registering for a free online course (Class Central, 2018).

This figure is up by 20 million on the previous year and increases to approximately 130 million learners when China and other developing countries where English is not the primary language of instruction are included in the census. While globally MOOCs are still a major force in shaping thinking and the direction of the OER movement they have not yet replaced the textbook, as once predicted (Class Central, 2016), and rather it would appear the level of interest and activity in promoting open digital textbooks is gaining momentum.

Synthesis of the Literature

Most of the major open digital textbook initiatives over the past decade have taken place in North America. Of course, textbooks have traditionally been an essential part of higher education for the majority of students in the United States (US) (Fischer, Hilton, Robinson, & Wiley, 2015). While the drive for openness is anchored in deep philosophical roots the growth of open digital textbooks in the US has been partly a pragmatic response to economic crisis, underfunding of higher education and rising textbook prices. It is reported, for example, that from 1978 to 2013 textbook prices in the US increased 812% and that in 2014 a typical student spent about (US) \$2000 annually on textbooks (Baglione & Sullivan, 2016). Another US study claims that since 2006 the cost of college textbooks increased by 73%, which is over four times the rate of inflation (Senack & Donoghue, 2016). Despite rising costs Allen and Seaman (2016) found in their survey of over 3,000 US faculty that virtually all courses (98%) require a textbook, or related study materials, as part of their suite of required resources. Although the evidence of rising textbooks is clear, less is known about the extent of textbook piracy though those studies that have looked at this suggest that copyright infringement by students of textbooks is widespread (Scorcu & Vici, 2012).

Although there has been a proliferation of OERs in most disciplines over the past decade the reality is the level of awareness, curriculum integration and repurposing of open resources by teachers remains quite low at least in the US (Seaman & Seaman, 2017). However, open digital textbooks – essentially a collection of OER aggregated in a manner that resembles a textbook but may also be rich with media and hyperlinks – are an exception as they have proven easier to garner support of institutional leaders, policy-makers, and major charitable donors. This claim is evidenced by the strong lead taken by organisations such as the William and Flora Hewlett Foundation and in some cases government agencies, as clearly demonstrated in the BC Campus initiative.

BC Campus began in 2012 with a project to create a collection of open textbooks aligned with the top 40 highest-enrolled subject areas in British Columbia (Burgess, 2017). A second phase began in 2014 with an additional 20 textbooks. The project continues to grow with currently over 230 open digital textbooks available and at the time of writing the BC Campus OpenEd website claims that students have saved over \$5m (Canadian) through the initiative, which now includes over 40 participating institutions. While Burgess (2017) acknowledges beyond estimated financial savings that some of the other success factors are difficult to quantify the project has contributed to the wider acceptance of OERs and has helped in terms of changing institutional culture.

Looking to Europe

Around a third of the 28 European case studies reporting on open education policy initiatives previously mentioned above identify some type of current or planned open digital textbook project (Inamorato dos Santos et al., 2017). While few rival the scale of enterprise wide projects such as BC Campus in 2017 a major open digital textbooks initiative began in the United Kingdom (UK) led by the OER Hub to test the transferability of the North American model of success to the local context. More specifically, the UK Open Textbooks project is framed by the following overarching research question:

- What is the viability of introducing open textbooks in UK higher education through the testing of two proposed models: OpenStax and OpenTextbook Network approaches?

As part of the project a series of workshops has been offered throughout the UK along with the development of a teacher textbook survey. The findings of this survey, which have yet to be formally published, coupled with a growing body of research evidence on the usage, implementation and sustainability of open digital textbooks will inform our own work in the Irish higher education context.

Finally, in an examination of our own practice here in Ireland, we conducted a case study, through an analysis of textbook readings lists, of one Irish higher education institution. This focused on the cost, accessibility, and licensing of the textbooks being recommended to students by lecturers. This investigation, which used some innovative digital research methods, examined textbook prices from an official University course catalogue comprised of several thousand textbooks (Costello et al, 2018; 2019a; 2019b). Findings included low levels of openly licensed textbooks and

indeed digital copies of books. If students were to buy all books new, for a year of study, they could incur costs of up to \$1,806.50. We released the dataset and code used in this research in an open format for other researchers to use or build upon (Costello & Bolger, 2019).

Research Problem

At this point our knowledge of whether traditional textbooks remains core to the student learning experience in Irish higher education is largely speculative. With more widespread implementation of Virtual Learning Environments (VLE) throughout the sector and the growth of OERs it might be reasonable to assume that usage of textbooks is declining; however, we simply do not have data to support or refute this assumption. In a similar vein, we have little or no data on the amount of money Irish students spend on textbooks to support their study, to what extent they decide to purchase them, and if the costs are a significant barrier to their success. Accordingly, the research seeks to address this gap in our knowledge.

At a deeper level we still need further evidence to test the underlying assumption that the use of textbooks (print and digital) and the students who utilize them will have better academic experiences and demonstrate improved academic performance (Hilton, 2016). Putting aside any projected financial savings the deeper question is whether the development of open digital textbooks leads to a transformative advantage over the use of more conventional study resources. In other words, we should not lose sight of the risk of merely replacing an old technology (print textbooks) with a newer innovation (open digital textbooks) without fundamentally questioning the role and value of the textbook in new 21st century models of education.

Research Problem

Set against this wider backdrop and the emerging literature in the area the research seeks:

- To investigate the current and intended future usage of open digital textbooks in Irish higher education and their transformative potential.

Research Questions

The research is framed around five overarching research questions:

- What is the current usage level of textbooks in Irish higher education?
 - What is the current use of textbooks?
 - What is the current use of digital textbooks?
 - What is the current use of open digital textbooks?
- What awareness, experience and knowledge do Irish educators have of open digital textbooks?
 - What value do lecturers place on textbooks?
 - What is lecturers' practice in terms of textbooks?
 - What are lecturers' perceptions of the quality, suitability and potential of open digital textbooks?
- What awareness, experience and knowledge do Irish students have of open digital textbooks?
 - What value do students place on textbooks?
 - What is students' practice in terms of textbooks?
 - What are students' perceptions of the quality, suitability and potential of open digital textbooks?
- What are the perceived advantages and disadvantages of adopting open digital textbooks in Irish higher education?
 - What are the pedagogical benefits?
 - What are the actual and potential financial benefits?
 - What are the potential disadvantages?
- What are the perceived barriers and enablers likely to influence the successful enterprise-wide adoption of open digital textbooks?
 - What are the major barriers?
 - What are the major enablers?
 - What are the key lessons for Irish educators?

Methodology

The research adopts a mixed methods approach involving online surveys; follow up interviews; and analysis of public databases and relevant websites potentially listing textbook requirements. There are three main work packages. The first work package

involves an environmental scan and national baseline survey of the sector to establish the status of textbooks, and more specifically the level of adoption of open digital textbooks, in Irish higher education. Work package two will undertake an institutional case study of current practice around the use of textbooks and adoption and perceived value of open digital textbooks more particularly. The final work package aspires to develop an open digital textbooks initiative and wider Irish community of practice in the area based on findings from earlier phases and key lessons from international literature.

Preliminary Findings

To date the findings of the first work package undertaking an environmental scan of the Irish higher education sector reveals a dearth of open digital textbook initiatives. For example, a Google search using the terms *open textbook*, *open digital textbook*, *Ireland*, and *Irish Higher Education* reveals only one result on the first three pages relevant to Ireland, which happens to be a Twitter stream dating back to 2010. Further analysis of potentially relevant links using the wider search terms *Ireland* and *Open Educational Resources* locates just two main initiatives of any note.

Firstly, search results provide information on the now closed “National Digital Learning Resources (NDLR) service” funded by the Higher Education Authority (HEA) of Ireland. The NDLR was an OER service providing a national open repository, online resource bank and community portal, shared between the seven universities and 14 institutes of technology (Marcus-Quinn & Diggins, 2013). The service was originally established and funded by the HEA in 2005 as a pilot project and went to full service in 2010. The NDLR’s mission was to promote and support Higher Education sector staff in the collaboration, development and sharing of learning resources and associated teaching practices (McAvina & Maguire, 2011).

According to Marcus-Quinn and Diggins (2013) by 2012 the NDLR service hosted over 27,000 digital teaching and learning resources. From 2005-2012 the HEA spent approximately €5m on the NDLR service (HEA, 2012; cited in Marcus-Quinn & Diggins, 2013). Given the level of funding and mixed reviews of the service the NDLR was placed in limbo in 2012 before any formal evaluation could take place (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2015b). The NDLR’s demise remains a sensitive topic in Ireland and although speculative the experience may partly explain why there has not been a more focussed policy response to the emergence of open digital textbooks as a subset of the wider OERs movement.

The second major initiative this wider search strategy identified was a report on “Learning Resources and Open Access in Higher Education Institutions in Ireland” written by a large team led by Dr. Angelica Risquez from the University of Limerick (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2015b). While the emergence of open digital textbooks is acknowledged in this report to a large extent the deliberate focus on “little OER” placed “big OER” such as MOOCs and larger scale open education initiatives outside of scope. This decision is partly understandable given the conception of OER was based on the following William and Flora Hewlett Foundation definition which incorporates a repurposing dimension:

“Teaching, learning and research resources that reside in the public domain or have been released under an intellectual property license that permits their free use and re-purposing by others. Unlike traditionally copyrighted material, these resources are available for ‘open’ use, which means users can edit, modify, customize, and share them” (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2015b; pp.7-8).

In many respects the report places the value of little OER in their ability to go beyond and/or provide alternatives to textbooks. This perspective is reflected in the national online survey of academic staff completed as part of the project by 219 respondents in April 2015, with one participant reporting:

“Yes, I value having resources available. Not being constrained by what the textbook authors and editors decide to provide for us is very important. It’s part of the academic dialogue” (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2015b; p.90).

It follows that no explicit reference to the potential of the open digital textbook movement appears in the report’s final recommendations, which focus on raising greater awareness and showcasing excellent OER, embedding OER and a wider Open Educational Practices (OEP) philosophy more intentionally within national professional development initiatives, and a call for an ongoing programme of action research.

A follow up search of the National Forum for the Enhancement of Teaching and Learning in Higher Education’s website along with their dedicated T&L Scholarship Database using the terms *textbook* and *open textbook* revealed only one other relevant publication. A review of Ireland’s higher education technical infrastructure conducted in 2016 compared the findings of an online survey of senior IT managers and Chief Information Offices (CIOs) at 22 Irish institutions with the results of the annual US-based Campus Computing Survey to provide an international benchmark on key priorities (National Forum for the Enhancement of Teaching and Learning in Higher Education, 2017). As shown in Figure 1 below using survey results reproduced from the original report (p.26), 68% of Irish respondents compared to 79% in the US perceive that open source textbooks and OER content will be an important source for instructional resources in five year. The gap between the two countries is even more notable in the findings that only 17% of Irish respondents as opposed to 38% in the US consider open source OER textbooks very important looking to the future. Therefore, from the perspective of Irish senior IT managers and CIOs the adoption and wider use of open digital textbooks in higher education at this time does not appear to be a high priority initiative.

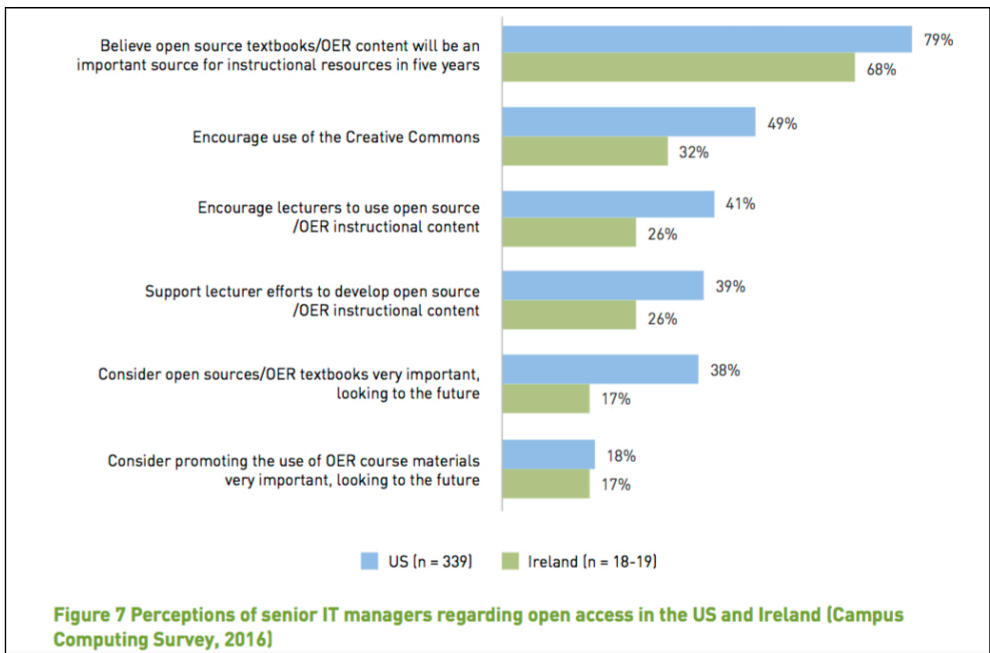


Figure 1. Perceptions of senior IT managers regarding open digital textbooks

Finally, two other desk research methods were deployed to locate relevant open digital textbook initiatives. A dearth of activity in this area was found by using the search function on the websites of all Irish universities and institutes of technology using the term *open textbooks*. In a similar vein, searches of the websites of the Computers in Education Society of Ireland (CESI) and Irish Learning Technology Association (ILTA) yielded no relevant results; and nor did a keyword search of the published proceedings of related conference papers and presentations dating back to 2010.

At the institutional level a preliminary analysis of an internal database of textbook requirements for students at Dublin City University (DCU) for Semester 1 and 2 of the 2017/18 academic year confirms widespread expectations of textbook use. This conclusion is triangulated by information contained in a publicly searchable website listing textbook requirements. For example, over 3,000 of DCU's modules mention at least one textbook. Of the textbooks list 15,922 (72%) are classified as required whilst 6,729 (28%) are listed as recommended reading. However, further analysis of the specific textbooks listed is required to identify what proportion is available in printed and digital formats. This analysis is currently underway at the same time as the development of an online survey to gather data on the practices and perceptions of both staff and students concerning their use (or non use) of print and digital textbooks. We hope to report the results of these surveys along with the findings of a national survey exploring the use of and perceptions towards the value of open digital textbooks in the next six months.

Conclusion

This research in progress addresses a significant gap in our understanding of the adoption, patterns of use and perceived advantages and disadvantages of open digital textbooks in Irish higher education. The study takes place at a time when there remains a dearth of government policy and related research in the use of both big and little OERs in Ireland. This interpretation is supported by our desk research of Irish policy texts and evidence from multiple sources revealing no major initiatives more specifically in the area of open digital textbooks. Given the North American experience and growing level of interest in both the UK and Europe we hope this Irish study will contribute to better understandings of the potential transformative advantages of open digital textbooks. Of course, like MOOCs we also understand the affordances of textbooks depends on how they are used by teachers and learners and to this end the research aspires to launch an Irish open digital textbooks initiative as the basis further learning and development.

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Digital Resources in “Boundary Crossing”: A Study of Intercultural Learning in Higher Education

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Abstract

This study analyses international students “boundary-crossing” activities and appropriation of digital tools and resources during intercultural learning experience. Students who participated in the research are considered sojourners – temporarily living in the UK academic and cultural environment. The paper employs two theoretical approaches – the appropriation of cultural resources drawing on Pachler et al. (2010), and the model of boundary crossing (Akkerman & Bakker, 2011), which provides an alternative route to understand appropriation of digital tools to fulfil a bridge function.

Such theoretical approaches allow an interpretation that boundaries carry learning potential through the spectrum of transformative learning where students are seen as active agents shaping their learning trajectories. This paper contributes to the debates around the deficit view of internationalisation, portraying international students as “victims” or “problems” which creates a dichotomy between the learning strategies of Asian and Western students. This study highlights that international students’ intercultural learning experience involves ongoing engagement with social networks and artefacts. There is also an aspect of the expansion of the international students’ capacity at a personal level and their strategic agency to appropriate digital tools to cross different sociocultural contexts such as bridging political, cultural and language differences.

Abstract in Chinese

本文探索跨文化学习中对数字工具和资源的跨界活动和分配挪用。参加研究的学生暂时居住在英国的学术和文化环境中，可以被视为旅居者。本文借鉴了两个理论方法：一是借鉴了Pachler, Bachmair, 和Cook提出文化资源分配和挪用，以及Akkerman和Bakker提供的跨界模

型。这两个理论为理解分配挪用数字工具来实现桥梁功能提供了一个新的途径。

采用这样的理论方法，学生被视为塑造他们学习轨迹的积极推动者，而边界可以通过变革性学习来提供学习潜力。此理论对围绕国际化的赤字观点的辩论（将国际学生描绘为‘受害者’或‘问题’，从而将亚洲和西方学生的学习策略二分法作出了贡献。该研究强调，国际学生的跨文化学习经历涉及与社交网络和人工制品的持续互动，个人的能力和动力感得到扩展，进而适当挪用数字工具来跨越不同的社会文化环境（例如弥合政治、文化和语言差异）。

Key words: intercultural learning; boundary crossing; appropriation; digital tools; international students

Appropriation of digital tools and resources for “boundary crossing”

Diversity and mobility in education presents both enormous opportunities and challenges: international students are regarded as vital to the UK higher education sector due to their cultural and economic contribution, with China being the largest source of international postgraduate (PG) students (British Council, 2014). Yet, international students embarking on university study bring with them their own diverse characteristics and experiences, which has led to growing attention for the process of international students’ intercultural learning (Gill, 2007). Intercultural learning is “acquiring increased awareness of subjective cultural context (world view), including one’s own, and developing greater ability to interact sensitively and competently across cultural contexts as both an immediate and long-term effect of exchange” (Bennett, 2009 p.2). The focus of this paper in intercultural learning is placed on one form of transnational higher education, programmes where students are studying abroad. Empirical studies (e.g., Liu & Winn, 2009; Hughes, 2013) show that tensions which occur when encountering a distinct cultural experience are more overwhelming at the initial stage of students’ adaptation, particularly for Masters level postgraduate students since most of these full-time postgraduate programmes in the UK are expected to be completed within a year. Nevertheless, such intercultural experiences can lead to a transformative learning process in which international students negotiate learning as a dynamic interplay between challenges and professional development (Gill, 2007; Gu, Schweisfurth, & Day, 2010; Tran, 2013).

This cross-cultural learning experience essentially involves “boundary crossing”: meaning “a person’s transitions and interactions across different sites” (Suchman, 1994). Boundary crossing is often used to depict efforts made by people both as the personal and as the collective to integrate different knowledge learned for different contexts (Suchman, 1994). A boundary means “sociocultural difference leading to discontinuity in action or interaction” (Akkerman & Bakker, 2011; p.133). Boundaries can be viewed as discontinuities in various forms of practices, such as discontinuities in a community of practice and social activities (Walker & Creanor, 2005). Boundaries can also occur during the process of intercultural learning, for instance, Singh (2005) found that while Chinese international students continue to experience a sense of “strangeness” of the host culture, politics and pedagogies in Australian universities, they become autonomous agents of their life-changing experience and take responsibilities to participate in the intercultural community of learning.

These diversities are particularly important in the contemporary context as learning is increasingly mediated by online technologies (Hughes, 2013). China’s social networking sites presents a different picture compared to the Western counterpart, with close imitators of those in the West’s contributing to a participation gap (Guo, Shim, & Otondo, 2010). Differentiation in technology conditions, proliferation of online instruction in Western countries may place Chinese international students in a relatively alien learning context (Chen, Bennett, & Maton, 2008). Researchers (e.g., Mehra & Bilal, 2007) stated that international students confront challenges in applying learning approaches that address the importance of utilising online resources.

Pachler and his colleagues (2010) proposed a social ecological approach called *mobile complex* in which educational uses of technologies are viewed as part of sociocultural practices. The conceptual components of mobile complex is composed of three interrelated aspects, which are: *structure*; *agency* and *cultural practices*. Structure denotes the “sociocultural and technological structure” in which the appropriation of digital tools take place (Pachler, Bachmair & Cook, 2010; p.14). According to Pachler et al. (2010), the fundamental construct of the mobile complex is the idea of appropriation, which in their view, is “the processes attendant to the development of personal practices with mobile devices” and these processes are considered largely to be “interaction, assimilation and accommodation as well as change” (Cook, Pachler Bachmair & 2011). Agency involves students’ personal choices and capacity to take action on the world through the use of digital tools and Cultural Practices views learning as culturally situated meaning-making of every life, including inside and outside of educational institutional settings.

The viewpoint that learning involves a meaning-making process mediated through interaction with other learners and with artefacts is echoed by sociocultural theorists (e.g., Engeström, Engeström, & Kärkkäinen, 1995). A shared insight of sociocultural approach is that students' learning takes place in historically situated practices mediated by their culture in which certain activities are regarded as valuable for their education. Participation involve various actors representing different cultures and students' engagement is mediated through artefacts such as technology or explicit instructions depending on the priorities of their cultures. Through participating in social practice in an activity with other members of their communities, students negotiate the meanings of their culture and ultimately achieve the internalisation as an ongoing process of appropriation in the authentic activities of a community by accepting, rejecting and transforming meaning as they experience it (Engeström et al., 1995; Vygotsky, 1978; Lave & Wenger, 1991).

The boundary crossing process during intercultural learning can be facilitated by *boundary objects*, namely objects that build bridges of different worlds to achieve hybrid situations (Star & Griesemer, 1989; p.393). An example of a boundary object within the context of vocational education can be portfolios used by mentors and supervisor to keep a track of their students' development (Meeus, van Petegem, & van Looy, 2006). This paper prefers the term *boundary crossing tool* over boundary objects, as it stresses the agency of learners, and we view them as a form of *cultural resource* that "integrates media, mobile devices, internet tools and services under the functional description of resources". The concept of boundary crossing emphasises the focus on ongoing, dimensional actions and interactions between contexts rather than a one-sided transition (Akkerman & Bakker, 2011).

The notion of boundary crossing is associated with how Bhabha (1990) used the notion of *third space* in intercultural learning. Bhabha (1990) called attention to the way that the encountering of two different cultures may open up a third space where meaning is negotiated. Burnapp and Feng (2007, cited in Burnapp, Feng, & Zhao, 2012) extended the concept of third space to investigate the possibility of a virtual third space. Later, Burnapp et al. (2012) studied how Chinese international online distance students use the Internet and social networking sites and concluded that the creation of mixed online communities of Chinese and British students facilitate intercultural learning in such a way that leads to a hybridity of previous and new expectations. This paper provides a sociocultural perspective to learning using digital tools within a transitional experience. It respects a learner-centred collaborative

leaning approach, wherein it is essential to explore the influence of cultural practices, social relations and community of learners (Prieto et al., 2016).

Research Methods

The research was carried out at the University of Leicester where over 25% full time students are international students (see www.thecompleteuniversityguide.co.uk/leicester/international). The university library holds over one million volumes and most of these are available online. The University has around 14,000 computers at the campus. Moreover, students have access to group study rooms and wireless connectivity.

The study employed a mixed methods design that combined quantitative and qualitative research methods (Creswell & Plano Clark, 2011). A questionnaire was selected for quantitative data collection. Qualitative data collection took place over a 15-month period from mid-2014, and research participants were Chinese international students on a master's programme at the University of Leicester. Data collection instruments included mind maps, semi-structured interviews and photographic journaling. In total, 409 valid survey responses were collected, 30 students took part in the interviews. Among these 30 students, 14 students did mind maps, 4 students sent photography and 4 students took part in observations. The information about online survey Participants can be seen from the below:

As it can be seen from Figure 1, 65% of the participants are female and 35% are male. The majority of the students (71.3%) are in the age group 20-24. Of the total participants (n = 403), 16.7% of the students had working experience, and 82% of the participants did not have working experience. The profile of the survey participants can be seen from the Appendix 1.

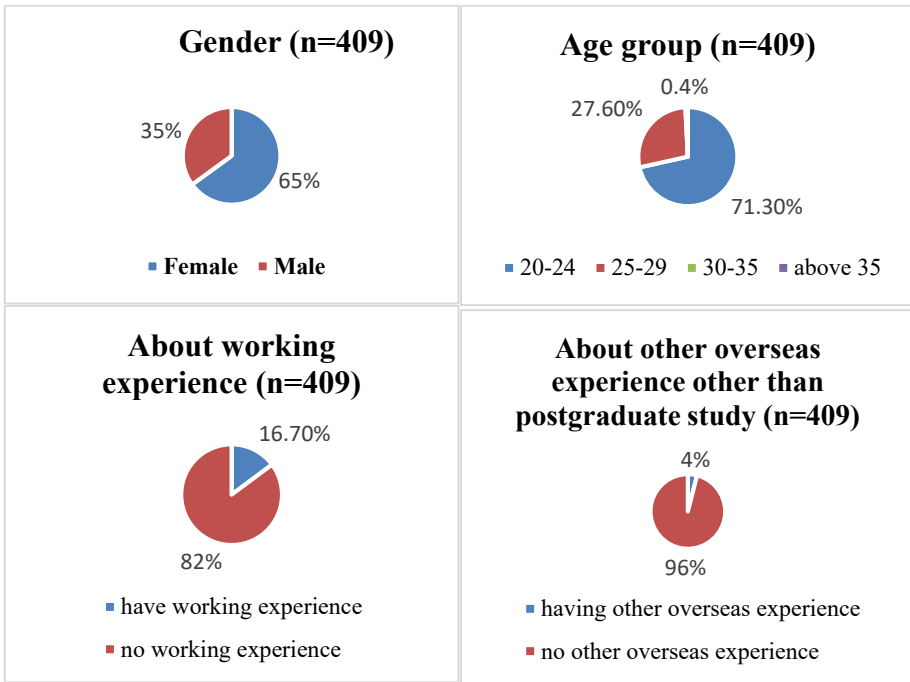


Figure 1. The profile of the survey participants

Survey

The questionnaire “A Study into Development of Digital Skills among Chinese Postgraduate Students in Leicester University” was designed based on the research inquiry. The design of some questionnaire items was adapted from the “Pelicans research project” based at the University of Leicester

(<https://www2.le.ac.uk/departments/beyond-distance-research-alliance/projects/pelicans/pelicans-survey>).

Questionnaire item 1 asked about participants’ ownership of a set of digital tools and how they access the Internet comparatively for undergraduate study and postgraduate study; Questionnaire item 2-4 aimed at collecting data on participants’ patterns of technology use for different learning activities, and the translation of digital practices from undergraduate study to postgraduate study. Questionnaire items 5 and 6 touched on the degree of engagement with digital technology for learning-related activities. Questionnaire items 7 and 8 applied Likert scale to explore participants’ attitudes towards the usefulness of digital technologies for learning and the barriers of using digital technologies. Questionnaire item 9 was an open-ended question which generates text-based data of participants’ recommendations on how to cope with barriers of using technologies for learning.

Mind maps

Mind maps were used as a tool for preparation for interviews. Participants were invited to create mind maps to map out their use of various digital devices and technologies for educational purposes. Participants were encouraged to provide details, such as rating the relevance of different technologies, and to write descriptions of how they use certain technologies for learning. Wheeldon (2011) explained that qualitative research serves as an important means to explore meaning through looking into the ways in which individuals construct and frame their accounts of knowledge, experience and perception. For the depth of the qualitative data, mind maps facilitated a more comprehensive reflection of experiences by enabling participants to develop rehearsed narratives (Hathaway & Atkinson, 2003).

Semi-structured interviews

Semi-structured interviews were used as a primary method to elicit participants' viewpoints of the topic without pigeonholing the responses of those interviewed, and in turn semi-structured interviews allowed the researcher to identify unexpected things revealed by interviewees and so facilitate further probing. Thirty participants took part in interviews and the interview schedule began with demographic questions that asked their education background, subjects studied at undergraduate and postgraduate levels, the demographic area in China and IELTS examination results. The sequence of interview questions ranged from general to the more specific. Participants were asked about their general studying experience such as the formats of the assignments and assessments, they were then asked to share their experience of using mobile technology.

Photographic journaling

The use of photographic journaling was inspired by several works on social science research methodologies and empirical study, including the Experience Sampling Method (Hektner, Schmidt, & Csikszentmihalyi, 2007), the Day Reconstruction Method (Kahneman et al., 2004), and the Day Experience Method (Riddle & Arnold, 2007). The Experience Sampling Method (ESM) is a way of collecting data about the context and content of participants' daily lives relevant to the focus of the study. ESM has the potential to generate a rich and in-depth perspective on moments in a participant's life (Hektner et al., 2007). The implementation of this method was inspired by Riddle and Arnold (2007). WeChat (instant messaging app similar to WhatsApp) groups were established with the research participants. With prior agreement with the participants, they were prompted at several random points by

instant messages. If participants were doing study related activities, they were asked to use digital devices (e.g. mobile phones or tablets) to record their learning scenarios and the use of materials and devices they have at hand, such as taking photos or taking videos. They were invited to answer some questions at the time of the message if they were doing any study-related activities. The questions included information about the time of day when they were studying, with whom they are studying, study location, general feelings and issues about study. Out of 30 interviewees, 4 students took part for the photographic journaling activity that lasted a month, and participants were invited to return the photographic journaling each week.

Analysis and results

Descriptive statistics were used for quantitative data, which involves neither inference nor predictions (Cohen, Manion, & Morrison, 2007). This is because the purpose of the survey was to investigate the overall patterns of digital practices. Qualitative data analysis has gone through a continuous and iterative process, which was suggested as three interactive concurrent flows of activities: “data condensation”, “data display” and “conclusion drawing/verification” (Miles, Huberman, & Saldana, 2013).

Survey results depict the general picture of the ownership of digital tools and major transitions, among participants in terms of using digital tools for information searching, management and learning related activities and the qualitative data help to answer how and why students begin to adopt certain digital tools.

Table 1: Ownership of devices for undergraduate study and postgraduate study (n = 409, questionnaire item 1).

Digital device	Number and percentage of respondents who owned it for undergraduate study	Number and percentage of respondents who owned it for postgraduate study
Desktop	221 (54%)	137 (33.5%)
Laptop	339 (82%)	350 (85.6%)
Digital camera	251 (61.4%)	131 (32%)
Phone with Internet	362 (88.5%)	358 (87.5%)
MP3 player/iPod	220 (53.8%)	135 (33.0%)
iPad/Tablet	313 (76.5%)	323 (79.0%)
Amazon Kindle/other e-reader	79 (19.3%)	166 (40.6%)
Gaming device	75 (18.3%)	73 (17.8%)

According to the Table 1, the percentage of participants who own a laptop, phone with Internet, iPad/Tablet, and gaming devices almost levelled off for undergraduate and postgraduate study. Three devices (i.e., laptop; phone with Internet; iPad/Tablet) have

been the most popular tools among sample students since their undergraduate study. The ownership of an Amazon Kindle or other e-reader has increased from 19.3% to 40.6%, which indicates many of the participants began to use these during their postgraduate studies. The percentage of participants who owned a desktop or digital camera decreased from 54.0% to 33.5% and from 61.4% to 32.0% respectively. Access to those devices to connect the Internet. For example, using a desktop provided by the library to access the Internet has been reported by interview respondents. Survey also reveals the challenges of using digital tools among Chinese international students during postgraduate study, and the result is represented in Table 2.

Table 2: Mean and standard deviations of responses to statements about participants' personal barriers of using digital tools for learning (n = 409, questionnaire item 8.2, Cronbach alpha = 0.810)

Statement	Mean	Standard deviation
I lack previous experience of using Western digital tools and sites due to some were not accessible before.	3.20	0.949
I feel I lack the motivation to adopt new digital tools or social networking sites	3.18	1.009
Social networking sites is not very useful for my coursework learning.	3.14	1.168
I feel it is difficult to understand online English terms due to language inadequacy.	3.31	1.006
I find it is difficult to find, identify and view relevant documents.	3.18	0.992
I lack good grasp of technologies.	3.17	0.994
I feel it is difficult to synthesis online information.	3.25	1.057
I feel it is difficult to evaluate and analyse online information.	3.36	0.980

Questionnaire item used Likert scale questions and statements were measured in questionnaire item 8.1 on a scale of 1-5 (1 = *strongly disagree*; 2 = *disagree*; 3 = *not sure*; 4 = *agree*; 5 = *strongly agree*). In analysing the mean values of the items, means of less than 3 were regarded as negative and means with a value of more than 3 were regarded as positive to the statement. There seems to be more students who report that it is difficult for them to evaluate and analyse online information (mean = 3.36). There was also general agreement on the difficulty in relation to the item lack of previous experience (mean = 3.20). Sharpe and Beetham (2010) argued that *functional access* (ownership of digital devices, access to resource and time) is the fundamental step for students to use technology effectively. Research data shed some light that there is not a big difference in terms of their ownership of digital devices from undergraduate study to postgraduate study. However, the study confirms that access to network and information is an important mediating factor that influenced participants' digital practices. The quantitative data provides a snapshot of students'

uses and adopt of digital tools and resources during the transition, and the qualitative data provides more insights into how international students appropriate digital tools to cross boundaries.

Qualitative data was analysed in terms of Akkerman and Bakker's (2011) framework that identifies four learning mechanisms regarding the process of boundary crossing. These are:

- Identification – (re)defining intersecting cultures in light of each other.
- Coordination – mediating artefacts and procedures enable common practices in distributed work.
- Reflection – observing and explicating differences and similarities between practices and thus to value each other.
- Transformation – changes in practices and even hybridity of practices.

We studied how Chinese students cross boundaries through appropriating cultural resources in their intercultural learning experience, and report themes in relation to the above four learning mechanisms.

Identification

The mechanism of identification takes place by interpreting one practice in the light of another, focusing on differences and similarities. In turn it leads to the underlying need for a renewed understanding of different practices and the reconstruction of identities to overcome discontinuities (Akkerman & Bakker, 2011). As observed in interview data, the participants were consistently comparing their experience during their undergraduate study in relation to uses of digital technology and social media. For example, a Virtual Learning Environment (VLE) such as Blackboard is a key learning technology in UK universities. However, only 5 out of 30 students reported that they had used VLE for their undergraduate study in China. Some of these students mentioned using different VLEs for undergraduate study in China, such as Moodle (P5, male, age 23, Management) and Zhengfang Learning Management System (LMS) (P8, female, age 23, Translation), while the use of VLEs during their undergraduate study was mainly restricted to selecting courses, submitting assignments and checking the outcome of their exams (P5, P8). Others also mentioned differences, such as:

“Basically, the website in the university [where undergraduate studies were carried out] was used mainly to promote the university and to announce events. We also had university account that allows users to download articles from CNKI [a nation-wide central database in China] for free. However, unlike the website for postgraduate study [at Leicester], it does not have a system that works like Blackboard as a central platform for learning resources. There were not many things to be downloaded and to view. [Undergraduate] tutors did not share slides and materials. Maybe some did share, but only those famous teachers and in well-known disciplines” (P22, female, age 23, Media).

“I feel now I can make use of online resources because we have Blackboard. I mainly used printed books and CNKI for undergraduate study. But now the Leicester university database provides easy access to journal articles” (P1, male, age 23, Translation).

Understanding the social media and technology space in China is important for educators who try to engage with Chinese international students. In China, social media sites like Facebook, YouTube and Twitter are inaccessible without a VPN (Virtual Private Network). These conditions underscore how different China’s Internet is compared to that in the West. In China, the National Knowledge Infrastructure (CNKI) serves as the most-used academic online library, and it contains comprehensive databases and resources such as journals, doctoral theses, masters’ dissertations, e-books, newspapers and so on (Wan, Hua, Rousseau & Sun, 2010). Most of the interviewees (n = 25) reported using CNKI to search for resources when they had written assignments (e.g. essays), mainly driven by their undergraduate institutions. As can be seen from the transcripts, students are comparing their previous practice with new practices. A lot of students mentioned about their uptake of Google Scholar, University library’s A-Z database, Wikipedia and YouTube for learning purposes during postgraduate study. Some students were introduced to discipline-based databases by their tutors, such as using Lexis to search for news (e.g. P10, female, age 23, Public Relations). Most of participants (n = 19) noted that to email their tutors and course representatives about studying issues or to arrange meetings is a more common practice in the UK (e.g. P28, female, age 22, TESOL).

Coordination

The second learning mechanism is referred to as coordination, focusing on identifying effective methods to enable connections and cooperation in communication to maintain the flow of the work (Akkerman & Bakker, 2011). The analysis of the interview data showed that all interviewed students used mobile technology on a daily basis and most of them can compare different practices and use different social media services to cross sociocultural boundaries (i.e. the participation gap caused by different experiences and formal-informal gap). In China, WeChat as a mobile communication service gained prominence and has become the most widely used social networking service (Lien & Cao, 2014). WeChat has WhatsApp-like messaging tools, a Facebook-like news feed known as moments, and a PayPal-like wallet, together with other built in applications which seemingly does most things for users, such as, booking taxis, shopping online (CIC, 2015). Although our research participants had varying degrees of experiencing technology, some had more experience with Facebook and YouTube because of their previous overseas experience developed during student exchange programmes (P6, P11), undergraduate (P15) and postgraduate (P8) studying experiences. Nearly all participants reported clues that shed light on their process of sense-making of the new experience, as in this case:

“I have a Facebook group. Because I did a course ‘academic media’ at Leicester’s English Language Teaching Unit [where students learn English and academic writing skills]. There were 14 people in the group. The tutor named it as ‘new media’, and we used it for discussion. Students post questions and comments. Now, I do not use it very often. There are many Chinese students now in the university. So, I still use WeChat for communication as a dominant tool. And even some foreign students have been influenced by us to start using WeChat” (P14, female, age 24, Media).

“Facebook has some educational uses. For example, because it is an international environment, like we have Japanese, Hungarian students and students from other countries in the group. And they might not use WeChat, so we use Facebook and Messenger to discuss about the group assignment and arrange time for group meetings” (P10, female, age 23, Public Relation).

P14 described her adoption of Facebook as a result of an instance where Facebook was explicitly designed into a learning activity as a tool by her tutor to integrate the physical and virtual learning opportunities to cross the formal-informal boundary. Although Facebook was not designed to be used in formal classroom learning, it was used outside classroom to connect students who were working towards the same goal and to extend their learning and support. Although P14 mentioned that she still used WeChat as a dominant communication tool, and that the Facebook group was only active within the course time, later she described how she continues to add more contacts on Facebook and WhatsApp. These were used for groupwork, discussion and distribution of tasks and consequently helping her in her development of intercultural understanding and language skills. In another case, P10 pointed out the educational value of Facebook to bring students from diverse cultural backgrounds together for learning and to break the geographic boundary.

The photographic journaling activity also revealed similar themes. For example, P12 returned some photos of using WhatsApp for group work and was invited to talk about how he discusses questions with his classmates. As he lived in another city and was not able to travel to the University everyday, he often uses a photo-sharing tool to ask questions from one of his classmates. They also distribute work and make phone calls to explain questions when necessary. Examples are shown in Figure 2.

From P12's description, he did one group work with this peer and they added each other on WhatsApp to discuss group work. P12 said that although he was not in the same group for the following assignment with this classmate, they were still discussing course-related activities on WhatsApp. The analyse of data reveals mobile tools and social media such as Facebook and WhatsApp are appropriated by students to cross boundaries in different ways, such as: (a) technological boundary: students from different contexts use different technology under the wider dynamic environment, and some Chinese students perceive this differently and start to use Facebook or WhatsApp to connect their peers when necessary, (b) temporal and geographical boundary: because the formal classroom is time constrained, and, social media can assist in bridging communication connection and increasing immediacy to smooth coordination. It can be seen that mobile devices, especially with convergence of social media, allow for "seamless" and "just-in-time" learning opportunities to support information sharing and collective contribution (Sharples, Taylor, & Vavoula, 2007).

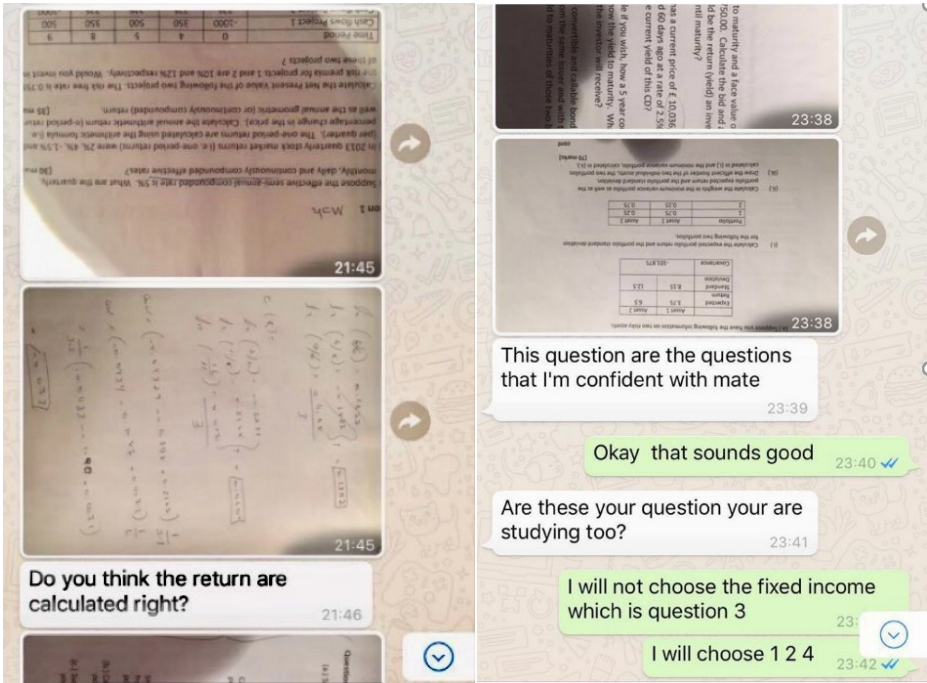


Figure 2. Example of using social network (e.g. WhatsApp) for discussion (P12, male, age 23, Financial Mathematics and Computation)

Reflection

This mechanism involves reflection as a means to define differences between practices and will in turn learn own and other’s practice (Akkerman & Bakker, 2011). The reflective impact involves dialogical inquiry, to scrutinise oneself from the others’ eyes and eventually engage multiple perspectives (Boland & Tenkasi, 1995, cited in Akkerman & Bakker, 2011). Students’ response entails how a self-reflective process facilitates them to rethink their biases, transcend limitations of knowledge and engage in cross-cultural dialogue, as in the case:

“At the beginning of the course of ‘the politics of digital media’, some lectures covered sensitive topics, which often offended Chinese students as they were feeling great about China. For instance, when the tutor was talking about the Fa Lung Gong [often understood as a spiritual practice in the Western context], he thinks the Chinese government is controlling the freedom of a normal organization. But some Chinese students argued that Fa Lung organization is an evil threat. I think it is because we have different mind-set. For them,

they may think people have the free rights to do things to court others' attention. But for us Chinese people, we think social order should not be disturbed. But because I took that course, I read many Western comments about the Chinese politics which make me feel it is difficult to say which one is real and I started to be critical about the Chinese media as they always report something in a different way compared to the Western media.” (P14, female, age 23, New Media).

P14's account reveals that conflicts and misunderstanding might occur when international students first enter the host country because teachers and international students were affected by a different political discourse. Some were able to reflect on their experience and developed understanding that media representation is not neutral, and she learned to critically compare different media representations. Later, she also described how her observation of Sina Weibo (a social media web tool in China) being used to accomplish an essay about writing sensitive words online developed her awareness of self-censorship behaviour among Chinese social media users.

Transformation

Transformation is discerned as the changes of practices or creation of new practices that stand in between the established practices (Akkerman & Bakker, 2011). Referring to the boundary-crossing interdisciplinary research of scientists, Palmer (1999) suggested that transformation denotes creation of a hybrid field that does not abandon existing practices but maintains value of the intersecting practices to one another. With interpretation, the analysis of data shows that participants embrace an aspiration to transform in a sense that, while maintaining their established digital practice, they also benefit from drawing on other cultural resources both for independent and collaborative learning with others, as in the case of the mind maps shown in Figure 3.

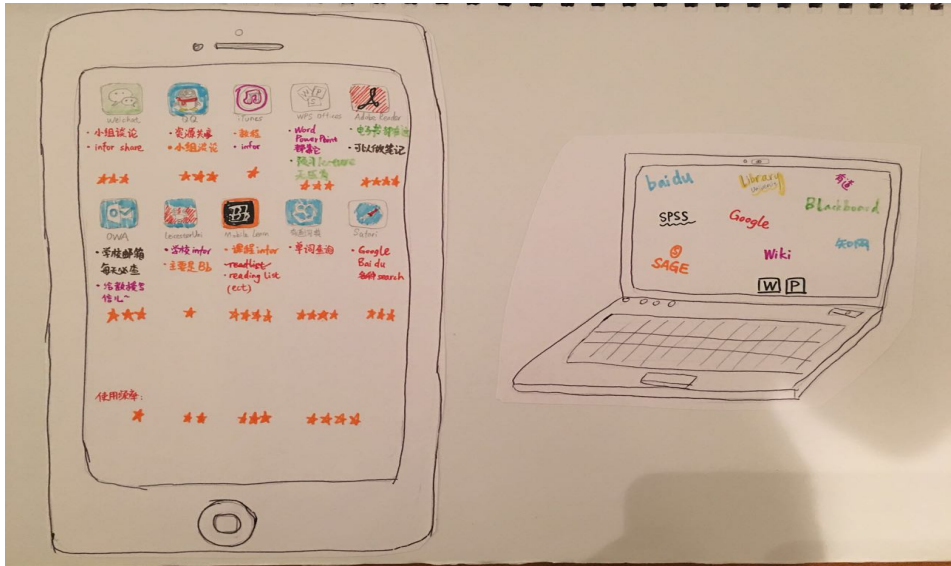


Figure 3. Example of frequently used digital sites and application for learning (P13, female, age 24, media)

Figure 3 shows a set of digital tools as well as services that are used most frequently by P13 for learning purposes. As can be seen, P13 drew various tools that she often uses on the laptop and these tools include both tools that predominantly use Chinese language and those dominated by English language. On her drawing of her iPad, it not only shows an array of applications, but also the activities she conducts with the help of these applications. She also uses the number of stars to indicate the frequency of use among these applications: more stars means that she uses the tool more often. The above figure implies that P1 has expanded her knowledge of newly experienced tools into her cognitive structure and developed a strategic attitude towards the uses of digital tools, integrating available tools and using them purposively dependent on context to achieve specific goals. Other mind maps and interview data also confirm that students do not simply transfer one practice to the other, rather they expand their knowledge and combine Western tools with Chinese tools.

Conclusions

The study reports on the appropriation of digital tools during their intercultural adaptation. The paper employs two theoretical approaches to improve our understanding of how international students make sense of and use digital tools and resources when they begin to adapt to a new higher education environment. One theoretical approach is the appropriation of cultural resources, the process through

which digital tools are shaped in use, which draws on the work of Pachler et al. (2010). The other approach draws on the model of boundary crossing (Akkerman & Bakker, 2011), which provides an alternative route to understand appropriation of digital tools as tools that fulfil a bridging function. The present study found that these sojourners' initial encounter of challenge and conflict can be translated into a new capacity for personal expansion and transformation. Technology and social media are useful cultural resources to cross boundaries in a variety of ways, such as across culture, time, locations, formal-informal and physical-virtual (Pimmer, Linxen, & Gröhbiel, 2012). Sometimes, the tutor acts as the designer of co-creative learning practices, as in the case of the Facebook group, which later contributed to students' increased social capital (which broadly stands for the resources accumulated through the relationships between people), and mobile-based multimodal representation can be used to facilitate an iterative learning cycles and discussion.

Evidence shows that students are constantly assimilating and accommodating their learning through expanding something unknown into their cognitive structures and making sense of the contextual influences by changing cognitive structures. This is in line with the concept of situated learning (Lave & Wenger, 1991). For example, students use mixed pedagogical strategies. They made use of the university's VLE (Blackboard), tutor's slides, and other web-based learning opportunities to lessen the stress of initial change of academic context (e.g. P22); they used different social media to foster communication and connection both with Chinese friends and students from other cultural backgrounds (e.g. P14); they researched on Chinese sites to look into case studies for their essays and search on English search engines for academic journals to write in English (e.g. P13). The use of digital tools and resources can be seen as an act of agency as Chinese international students "strategic making and remaking of selves, identities, activities, relationships, cultural tools and resources" (Moje & Lewis, 2007; p.18). This appropriation process also entails social negotiation, which represents "the internalisation of the pre-given world of cultural products" (Pachler et al., 2010). Understanding this is important in a context where learning becomes increasingly mediated by technologies which can contribute to improving pedagogical approaches for using digital tools and services to engage international students.

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Appendix 1

Profile of the survey participants (N = 409)

Demographic information of participants who filled questionnaire (N=409)

The profile category	Sub-category	Number of respondents	Percent	Valid Percent	Missing data
PG discipline	MAIE	16	3.9%	4.0	13
	TESOL	5	1.2%	1.3	
	Media & Communication	122	29.8%	30.8	
	Museum studies	11	2.7%	2.8	
	Translation studies	3	0.7%	0.8	
	Modern Languages	2	0.5%	0.5	
	Law	4	1.0%	1.0	
	Business and Economics	195	47.7%	49.2	
	Mathematics	1	0.2%	0.3	
	Biosciences	2	0.5%	0.5	
	Chemistry	6	1.5%	1.5	
	Engineering	29	7.1%	7.3	
	Study stage	Dissertation stage (enrolled in 2013)	22	5.4%	
Pre-sessional course (enrolled in 2014)		12	2.9%	3.0	
Master programme (enrolled in 2014)		73	17.8%	18.2	
Dissertation stage (enrolled in 2014)		91	22.2%	22.7	
Master including pre-sessional course (enrolled in 2015)		203	49.6%	50.6	

Identifying Learner Types in Distance Training by Using Study Times

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Abstract

Usage data of online distance-learning environments can inform educators about learning and performance of students. Among the usage variables, various time measures are indicative of learning approaches and performance level. In this study, we obtained study time parameters from distance-learning students and explored how it is connected to learner characteristics and learning. The data from 159 in-service teachers studying a script-based modularized distance training on media education were analysed. Students were clustered according to their module study times (using objective and subjective data) into 117 long and 42 short study-time learners (i.e., having studied at least one of their completed modules very fast). The clusters were compared on (a) their characteristics of learning strategy usage, domain-specific prior knowledge, intrinsic motivation, and computer attitude and anxiety and (b) their experienced difficulties of content and learning, their invested effort and experienced pressure while learning, and their performance. The clusters were expected to be meaningful entities that differ in relevant characteristics that influence distance-learning experience and performance. Long study-time learners showed a higher level of motivation and performance but a lower level of prior knowledge. We concluded that study time could be used as an indicator for problematic students.

Abstract in German

Nutzungsdaten von Online-Lernumgebungen beim Fernlernen können Informationen über den Lernprozess und die Lernleistung Studierender tragen. Unter den Nutzungsdaten erwiesen sich verschiedene Zeitmaße als Indikatoren für das Lernverhalten und das Leistungsniveau. In dieser Studie wurde die Lernzeit von Lernenden erhoben und untersucht, wie diese mit Lernenden-Eigenschaften, Lernerlebnis und Lernerfolg zusammenhängen. Die Daten von 159 Lehrkräften, die einen skriptbasierten, modularisierten Fernkurs zum Thema Medienbildung

absolvierten, wurden analysiert. Die Studierenden wurden anhand ihrer Lernzeiten pro Modul (anhand objektiver und subjektiver Daten) in zwei Gruppen eingeteilt: eine Gruppe (n = 117), welche angemessen lange jedes abgeschlossene Modul bearbeitete, und eine Gruppe (n = 42), welche zumindest ein Modul sehr schnell bearbeitete. Die Gruppen wurden bezüglich (a) Lernstrategienutzung, domänenspezifischem Vorwissen, intrinsischer Motivation, Einstellung zum Computer und Computerängstlichkeit und (b) wahrgenommener Schwierigkeit der Inhalte und des Lernens, investierter Anstrengung, erlebtem Druck beim Lernen und der Lernleistung verglichen. Erwartet wurde, dass die Lernzeit-Gruppen aussagekräftige Einheiten sind, die sich in relevanten Merkmalen unterscheiden, welche die Erfahrungen beim Fernlernen und die Lernleistung beeinflussen. Die Lerngruppe mit angemessen langen Lernzeiten wiesen eine höhere Motivation und Lernleistung auf, startete aber mit geringerem Vorwissen im Kurs. Es zeigte sich, dass die Lernzeit als Indikator für problematische Studierende herangezogen werden kann.

Keywords: distance training, student characteristics, self-regulated learning, cognitive load, distance-learning performance

Introduction

Distance learning research investigates how to foster successful student learning (Rowe & Rafferty, 2013). One research focus is to explore the extent that learner characteristics and skills determine learning outcomes and to elaborate predictive models of performance (Akçapınar et al., 2015; Yukselturk & Bulut, 2007). Although these approaches often start with diagnostics of learner characteristics before learning (e.g., Yukselturk & Bulut, 2007), diagnostic methods applied while learning have become popular (Kinnebrew et al., 2013; Lile, 2011). Modern approaches use data mining and learning analytics to identify learners that have problems. These methods attempt to benefit from objective data that are provided by various types of log systems that record online traces (Akçapınar, 2015). Data mining methods might result in better online diagnostics and intervention methods when the mechanisms that underlie usage patterns are known. Hence, relating usage patterns to student characteristics has been recommended to render them meaningful (Akçapınar, 2015).

The following study obtained objective and subjective study time indicators and used them to identify groups of learners in a distance-training course. The groups were first compared in characteristics that have already been shown to be empirically relevant for distance learning, including motivational, affective, cognitive, and skill aspects

(i.e., domain-specific prior knowledge, intrinsic motivation, computer attitude, computer anxiety, and use of learning strategies). The results of this analysis should show the extent that these correlates affect study time, which could serve as a starting point for adequate interventions. Second, group differences in learning were explored to show the relevance of study time for learning. These results should show how study time is related to learning. Our investigation was conducted against the background of self-regulated learning (Rowe & Rafferty, 2013).

Self-regulated learning, learning strategies, and motivation

“Self-regulation refers to self-generated thoughts, feelings, and actions that are planned and cyclically adapted to the attainment of personal goals” (Zimmerman, 2000; p.14). Self-regulation is relevant in multiple areas of human functioning but particularly plays an important role for learning in academic settings. In such settings, competent learning is basically understood as the initialization and adequate use of motivational, cognitive, metacognitive, and behavioural skills by learners (Weinstein et al., 2011). Accordingly, Rowe and Rafferty (2013) also defined self-regulated learning as a process that “involves students’ intentional efforts to manage and direct complex learning activities toward the successful completion of academic goals” (p. 590).

Self-regulated learning involves, according to Pintrich (1999), the use of learning strategies, which monitor, control, and regulate basic processes (e.g., eye movement and the decoding of verbal and pictorial information) for performing a learning task (Weinstein & Mayer, 1986). Learning strategies are categorized as cognitive, metacognitive, and resource management strategies. Cognitive strategies include strategies of rehearsal, elaboration, and organization, which are strategies of processing information (Weinstein et al., 2011). Rehearsal strategies are activities that focus on retention of information in working memory, elaboration strategies focus on integrating new information with prior knowledge, and organizational strategies serve the purpose of reducing and structuring information. Metacognitive strategies include the planning, monitoring, and regulation of cognitive processes (Griese, 2015; Pintrich, 1999). Resource management involve activities that generally support learning and shield against external disturbances or other influences (Griese, 2015).

Self-regulated learning has been found to be significantly related to (academic) performance (e.g., Agustiani et al., 2016; Song et al., 2016) and is assumed to be a key component of successful distance learning because of its high demands on self-regulation skills that are needed to succeed (Rowe & Rafferty, 2013). Research in the

context of online and distance learning has found support for this assumption, showing that management skills (in particular managing time and organizing learning effectively and having comfortable conditions for studying) predicted dropout and learning achievement (e.g., Hart, 2012; Ivankova & Stick, 2007; Lee & Choi, 2011; Lee et al., 2013; Stiller & Bachmaier, 2017a; 2017b; Tsai & Tsai, 2003; Yukselturk & Bulut, 2007).

Related to self-regulated learning, Lee (2013) discussed deep and surface learning approaches, characterized by deep and surface motives and strategies. Learning approaches refer to intentionally adopted behavioural patterns by learners while performing specific learning tasks. Hence, learning approaches are not learner characteristics. A surface learning approach is more likely to be guided by extrinsic motives with the intention of completing a course with minimal effort, and a deep-learning approach is more guided by intrinsic motives with a focus on comprehension (Baeten et al., 2013; Laird et al., 2014; Lee, 2013). Empirical research shows that deep learning approaches (i.e., both deep motives and strategies) correlate positively with online and distance performance, whereas surface learning approaches (i.e., both surface motives and strategies) correlate negatively (e.g., Akçapınar, 2015; Lee, 2013; Yurdugül & Menzi Çetin, 2015).

Overall, motivation to learn has been the focal correlate of dropout and learning success in distance and online training. Intrinsic motivation refers to performing a task because it is inherently interesting or enjoyable, whereas extrinsic motivation pertains to performing a task because it leads to a contingent outcome that is unrelated to the action (Legault, 2016; Ryan & Deci, 2000). Intrinsic motivation is correlated with high-quality and successful distance learning. In general, motivation has been found to be positively correlated with course persistence and negatively with dropout (e.g., Grau-Valldosera & Minguillon, 2014; Hart, 2012; Ivankova & Stick, 2007) and positively with performance (e.g., Artino, 2008; Waschull, 2005; Yukselturk & Bulut, 2007). A higher level of intrinsic motivation might make learners more resilient against learning problems and thus against the risk of dropping out in comparison to less intrinsically or extrinsically motivated learners. A higher motivational level might also make learners invest more resources in learning and especially process information more deeply, which in turn contributes to successfully passing tests (e.g., Lee, 2013; Yurdugül & Menzi Çetin, 2015).

Prior knowledge, computer attitude and anxiety, and self-regulated learning

Prior knowledge is known to predict school and academic performance and especially influence learning in various instructional settings (e.g., Hailikari et al., 2008; Song et al., 2016; van Gog et al., 2005). In general, possessing prior knowledge is considered a desirable condition for learning (e.g., Chi, 2006). Learning succeeds best when new information can be connected to available knowledge from long-term memory (van Gog et al., 2005). The ability to relate new information more easily to prior knowledge should result in better performance. Research has shown that prior knowledge affects performance in various educational contexts. The more students know, the more they gain when studying. In the context of complex learning environments, including distance learning scenarios, domain-specific prior knowledge (e.g., previous GPA or academic performance) can positively influence performance and dropout (e.g., Jiang et al., 2015; Knestricks et al., 2016; Song et al., 2016; Stiller, 2019; Stiller & Bachmaier, 2017a; 2017b).

Studies have also reported that a higher level of prior knowledge correlates with higher levels of self-regulation skills (e.g., Chi, 2006; Hailikari et al., 2008). Thus, prior knowledge and self-regulation separately contribute to explaining learning performance, but their impact on performance has been rarely investigated together in research (Song et al., 2016). In a recent study, Magno (2016) reported high multiple correlations of prior knowledge and self-regulation skills with academic performance in various subjects, but the details of the calculated regression analyses were not reported. The findings are not clear as to the extent that each of the seven self-regulation strategies and three prior knowledge aspects contributed most to the prediction of performance. Another recent study by Song et al. (2016) found no relationship between prior knowledge and self-regulation, but they reported significant effects of prior knowledge and self-regulation on medical clerkship students' performance.

Attitudes are mostly viewed as being composed of affective, conative, and cognitive components (Richter et al., 2010). From a cognitive perspective, attitudes are often conceptualized as beliefs, which are organized topically. In the context of distance and online learning, investigating computer attitudes could be informative. Richter and colleagues conceptualized computer attitudes as a belief about the computer being useful as an instrument for working and learning that develops through self-experience. They also proposed computer anxiety as a trait comprising affective aspects, such as feelings of anxiety, and cognitive aspects such as worrisome thoughts.

Computer anxiety and computer attitude are assumed to influence self-regulated learning, especially learning strategy usage.

The empirical literature has frequently investigated the relation between computer anxiety and computer attitudes with performance and also learning systems and computer usage by focusing on the influence of computer self-efficacy as mediating variable (e.g., Hauser et al., 2012; Saadé & Kira, 2009). The prevailing underlying assumption is that computer anxiety and computer attitude directly influence self-efficacy, which then directly influences the system usage and performance. In this context, negative attitudes and a considerable level of computer anxiety might lead to a lower level of self-efficacy and hence to surface learning or inadequate usage of learning strategies. The adequate use of learning strategies (e.g., information processing, monitoring comprehension, selecting main ideas and test strategy, resource management, and time management) is widely known to be correlated with positive computer attitudes and lack of computer anxiety (Tsai & Tsai, 2003; Usta, 2011; Wong et al., 2012).

Usage data of learning environments, study time, and learning

Usage data of an online or distance learning environment can inform educators about learning and in particular about performance (Akçapınar et al., 2015; Kinnebrew et al., 2013; Lile, 2011). The indicators, which could be used for analyses, depend on the user actions that can be performed in an online learning environment (Akçapınar, 2015; Akçapınar et al., 2015; Jiang et al., 2015; Lile, 2011). Two main categories of data are the starting point for analysis: occurrence of events (e.g., logins, posts, posts viewed, questions asked, questions answered, tasks completed) and duration of events (e.g., time spent on self-assessments, time needed to solve a task). Usage patterns gained by logfile analyses could be related to the level of performance and surface or deep learning approaches (Akçapınar, 2015; Akçapınar et al., 2015). The Akçapınar studies revealed that a less intensive usage reflected by low frequency of events (e.g., logins, posts) and short event times (e.g., total time spent in the online environment) correlated with surface learning and low performance, and the opposite pattern of intensive usage correlated with deep learning and high performance.

Akçapınar (2015) and Akçapınar et al. (2015) also found that among the investigated usage pattern variables, various time measures were indicative of learning approaches and level of performance, suggesting that time spent on the learning task is important for successful online learning apart from frequency of participation (e.g., Akçapınar, 2015). Furthermore, research results also suggest that the time spent with specific

information or actions might be more indicative of successful learning than the overall learning time (e.g., Jiang et al., 2015). In sum, overall learning time is composed of various partial durations, such as studying an educational video and also other – perhaps not useful – actions in a learning environment, which might be more indicative of successful learning, especially if these time measures are shown to more strongly correlate with effective and efficient learning processes.

Research objectives and expectations

Groups of students should be profiled based on their study periods in a distance training. Therefore, students were first clustered into fast and slow learners according to their module study times. First, the clusters were compared on the learner characteristics of learning strategy usage, domain-specific prior knowledge, computer attitude and computer anxiety, and in reference to their demographic characteristics. Second, they were compared in the experienced difficulties of content and learning, the invested effort and experienced pressure while learning, and performance. Clusters are expected to be meaningful entities that differ in (a) relevant individual characteristics that influence distance learning and (b) learning experience and performance (cf. Stiller & Bachmaier, 2019).

Method

Sample

The data of 159 (68% female; age: $M = 37.42$ years, $SD = 8.98$, range from 21 to 60 years) of the 318 in-service teachers who registered voluntarily for a distance training about media education in the German Federal State of Bavaria were analysed for this study. The criterion for analysis was completing at least one training module by taking the final module test. One half of the 318 registered teachers (159) dropped out of the training before completing any module. In-service teachers were recruited by promoting the training offline via flyers at all primary schools, secondary general schools, intermediate schools, and grammar schools in Bavaria (see the German classification of schools in Federal Ministry of Education and Research, 2017). Most teachers worked in intermediate and grammar schools, followed by primary and secondary general schools, and other school types (see Table 5 in the results section).

Description of the distance training

The training was based on a modular design and instructional texts. Students could learn at their own pace and at any time, and they could freely decide how many of the modules to study and in which sequence. The starting point of the training was a Moodle course portal. It consisted of nine modules, an introductory module, and eight modules about media education (e.g., Generation SMS: The use of mobile phones by children and adolescents; How to find a good learning program: Evaluation criteria for educational software). The introductory module informed about content, technical requirements, course organization, and learning skills. Each module had a linear structure of six sections: (a) An overview of the content and the teaching objectives, (b) a case example of a real-life problem, (c) a test of domain-specific prior knowledge used for activating prior knowledge and giving feedback about its level, (d) instructional text and optional supporting material, (e) a questionnaire about studying the module, and (f) a final performance test that evaluated learning success and provided feedback. The workload for studying a module was estimated to take 60 to 90 minutes. Students were supported via email, chat, and phone.

Procedure and measurements

The training was offered during a Bavarian school year lasting from October to July. The first login directed a student to the introductory module, which could be studied optionally. Then, students completed the first questionnaire assessing demographic information and the student characteristics in focus. Then, the eight course modules were accessible. A prior-knowledge test was presented at the beginning of each module and a final module test at the end. Students were questioned about each module before completing it by taking the final module test. A student could provide up to eight data sets, one for each module.

Table 1: Translated German items of the first questionnaire

Intrinsic motivation	
1	I think I will enjoy studying the modules very much.
2	I think studying the modules will be fun to do.
3	I think studying the modules will be a boring activity.
4	I think studying the modules will not hold my attention at all.
5	I think studying the modules will be very interesting.
6	I think this activity will be quite enjoyable.
7	I think I will not enjoyed studying the modules.
Computer attitude	
1	To me, the computer seems too unreliable to use as a learning tool.
2	I am often frustrated by the fact that the computer simply does not make sense to ordinary people.

-
- 3 When I use the computer for work, I constantly worry that it might break down.
 - 4 Working with the computer is often frustrating because I do not understand the machine.
 - 5 Sometimes my computer does things I do not understand.
 - 6 The computer programs that I use for learning and working are sometimes hard to understand.
 - 7 When I work with a computer, I feel that the computer does what it wants.
 - 8 If I have computer problems while I am working, I feel helpless.
 - 9 I wish I had to work less with computers.
-

Computer anxiety

- 1 I feel confident in using the computer.
 - 2 I panic when my computer crashes.
 - 3 In working with the computer, I am easily frustrated when problems occur.
 - 4 Working with the computer makes me uneasy.
 - 5 When working with the computer, I am often worried that I might break something.
 - 6 I feel that I cannot really control my computer.
 - 7 If possible, I avoid working with the computer.
 - 8 In the case of occurring computer problems, I stay calm.
-

Metacognitive strategies; (p) = planning, (m) = monitoring, (r) = regulating

- 1 I try to consider beforehand which areas of certain topics I have to study and which I do not have to study. (p)
 - 2 Confronted with a difficult subject matter I adapt my learning strategy accordingly. (r)
 - 3 If I do not understand everything I am reading, I will try to make a note of the gap in my knowledge and sift through the material again. (r)
 - 4 I decide in advance how much subject matter I would like to work through in this session. (p)
 - 5 Before starting on an area of expertise, I reflect upon how to work most efficiently. (p)
 - 6 I plan in advance in which order I want to work through the subject matter. (p)
 - 7 I ask myself questions on the subject matter in order to make sure that I have understood everything correctly. (m)
 - 8 In order to find gaps in my knowledge I sum up the most important contents without using my notes. (m)
 - 9 I work on additional tasks in order to determine if I have truly understood the subject matter. (m)
 - 10 In order to check my own understanding I explain certain parts of the subject matter to a fellow student. (m)
 - 11 When an aspect seems confusing or unclear, I examine it again thoroughly. (r)
-

Time management

- 1 I work according to a schedule.
 - 2 I decide on the times for my learning.
 - 3 I fix the hours I spend daily on learning in a schedule.
 - 4 Before each study period I appoint the duration of my work.
-

Learning environment

- 1 I work in a place that makes it easy to concentrate.
 - 2 I design my work environment in a way that I am distracted as little as possible.
 - 3 When learning I always sit at the same place.
 - 4 When studying I make sure that I can work uninterrupted.
 - 5 My workplace is designed in a way that makes it easy to find everything.
 - 6 At my desk I have the most important papers within reach.
-

Note: Items assessing intrinsic motivation, computer attitude, and computer anxiety were rated on 5-point Likert scales from "do not agree" to "agree" and items assessing learning skills from "very rarely" to "very often"

The first questionnaire (see Table 1) assessed intrinsic motivation (Interest/Enjoyment scale of the Intrinsic Motivation Inventory (IMI); Leone, 2011), attitude towards computers (i.e., the negative component of computer attitude in the sense of the computer being regarded as an uncontrollable machine; “Personal experience/learning and working/autonomous entity” scale of the Questionnaire for the Content-Specific Measurement of Attitudes toward the Computer (QCAAC); Richter et al., 2010) and computer anxiety (“Confidence in dealing with computers and computer applications” scale of the QCAAC; Richter et al., 2010), and skills in using metacognitive learning strategies, time management strategies, and strategies to arrange an adequate learning environment (Wild & Schiefele, 1994; Griese, 2015). Scale scores were calculated as means of items. A higher score expresses a higher level of the assessed characteristic except for computer attitude, which indicates a low negative attitude (a higher score could be vaguely interpreted as a “positive” attitude).

The module questionnaires (see Table 2) measured the effort put into learning and the tension experienced while learning (Effort/Importance and Pressure/Tension scales of the IMI; Leone, 2011), and the difficulty of the content and studying (one item each, often used for measuring intrinsic cognitive load and overall load against the background of Cognitive Load Theory; de Jong, 2010). Scale scores were calculated as means of items for each completed module, and the final individual scores were calculated as the mean of the module scores (varying from one to eight scores per student). A higher individual score expresses a higher level of the rated characteristics.

Table 2: Translated German items of the module questionnaire

Difficulty of content	
1	The content of the module was well comprehensible.
Difficulty of studying	
1	Studying the module was very difficult for me.
Effort put into learning	
1	I put a lot of effort into processing this module.
2	I didn't try very hard to do well at processing this module.
3	I tried very hard on processing this module.
4	It was important to me to do well at processing this module.
5	I didn't put much energy into processing this module.
Experienced pressure and tension	
1	I did not feel nervous at all while working through this module.
2	I felt pressured while working through this module.
3	I was very relaxed in working through this module.
4	I was anxious while working through this module.
5	I felt very tense while working through this module.

Note: All items were rated on 5-point Likert scales from “do not agree” to “agree”

Multiple-choice tests were used to assess prior knowledge (five items) and performance (15 items including the pre-test items) for each module. Each item comprised four answers of which at least one was correct. Tests were considered appropriate for measuring learning success because the training was intended to provide factual knowledge. Per module, the scores of the multiple-item scales were calculated as the mean of items. Then prior-knowledge and performance scores were calculated as percent correct. Finally, means were calculated across the number of completed tests. Table 3 presents the features of all used scales.

Table 3: Descriptive statistics of measurements

	#I ⁽¹⁾	#A ⁽²⁾	Range	<i>M</i>	<i>SD</i>	<i>n</i>	α ⁽³⁾	<i>M</i>	<i>SD</i>	<i>n</i>
Interest/Enjoyment	7	1	1-5	4.00	.62	318	.84	4.03	.58	159
Computer attitude	9	1	1-5	4.23	.59	318	.80	4.22	.61	159
Computer anxiety	8	1	1-5	1.77	.63	318	.82	1.81	.65	159
Metacognitive strategies	11	1	1-5	3.43	.61	318	.81	3.50	.55	159
Time management	4	1	1-5	2.47	.90	318	.83	2.51	.90	159
Learning environment	6	1	1-5	3.99	.68	318	.80	4.07	.62	159
Prior knowledge	5	1-8	0-100	48.71	16.34	255	.45 ⁽⁴⁾	51.47	14.67	159
Difficulty of content	1	1-8	1-5	1.67	.60	151		1.67	.60	151
Difficulty of studying	1	1-8	1-5	1.71	.69	151		1.71	.69	151
Effort/Importance	5	1-8	1-5	3.33	.54	151	.59 ⁽⁴⁾	3.33	.54	151
Pressure/Tension	5	1-8	1-5	1.81	.72	151	.87 ⁽⁴⁾	1.81	.72	151
Performance	15	1-8	0-100	80.12	13.82	159	.56 ⁽⁴⁾	80.12	13.82	159

Notes: ⁽¹⁾ Number of items used for assessment, ⁽²⁾ Number of assessments an individual score is based on, ⁽³⁾ Cronbach's alpha, ⁽⁴⁾ Mean Cronbach's alpha.

Results

A short and long study-time group were identified by considering the following three criteria.

1. The objectively measured period between completing the prior knowledge test and starting the final module test was calculated as an indicator of a module's study time. These periods were assumed to be reliable for detecting short study times. The criterion for a short study time was set to 20 minutes. A successful completion of any module was calculated with a workload of 60 to 90 minutes.
2. Longer periods are not reliable measures because they might include activity unrelated to learning (e.g., pauses or time between downloading and studying a script). Accordingly, the self-reported study time was used instead as an indicator of study time. The criterion to group learners into short or long study periods was set to 25 minutes.
3. Finally, learners who studied at least one of the modules with a short study time were assigned to the short study-time group; otherwise, they were assigned to the long study-time group.

This process resulted in 117 long study-time learners and 42 short study-time learners. Slightly more than half (57%) of the students in the short study-time group studied most of their modules quickly. No differences were found between the study-time groups for sex, age, type of school, and number of successfully completed modules (for analysis, the categories of 0 to 3 and 4 to 7 completed modules formed one group each; see Tables 4 and 5). The students mostly completed one (17%), two (12%) or all modules (43%), but less often three to seven modules (23%).

Table 4: The percentage of students working on modules in short or long study times

	No. (%) of students with only short study times	No. (%) of students with more short than long study times	No. (%) of students with equal short and long study times	No. (%) of students with more long than short study times	No. (%) of students with only long study-times
	14 (8.80)	10 (6.29)	5 (3.14)	13 (8.18)	117 (73.58)
No. of successfully completed modules	0 3 (21.43)				5 (4.27)
	1 6 (42.86)		1 (20.00)		20 (17.09)
	2 1 (7.14)				18 (15.38)
	3 1 (7.14)	2 (20.00)	1 (20.00)	1 (7.69)	8 (6.84)
	4		1 (20.00)		5 (4.27)
	5		1 (20.00)	3 (23.08)	8 (6.84)
	6				3 (2.56)
	7 1 (7.14)	1 (10.00)			1 (0.85)
	8 2 (14.29)	7 (70.00)	1 (20.00)	9 (69.23)	49 (41.88)

Table 5: The demographic characteristics of the teachers and their successfully completed modules

		No. (%) of studying students	No. (%) of short study-time students	No. (%) of long study-time students	λ^2	<i>df</i>	<i>p</i>
	Total	159 (100.00)	42 (26.42)	117 (73.58)			
Sex	Female	108 (67.92)	28 (66.67)	80 (68.38)	0.04	1	.839
	Male	51 (32.08)	14 (33.33)	37 (31.62)			
Type of school	Primary school	20 (12.58)	7 (16.67)	13 (11.11)	3.77	4	.439
	Secondary general school	14 (8.81)	4 (9.52)	10 (8.55)			
	Intermediate school	69 (43.40)	16 (38.10)	53 (45.30)			
	Grammar school	39 (24.53)	8 (19.05)	31 (26.50)			
	Other than listed	17 (10.69)	7 (16.67)	10 (8.55)			
Successfully completed modules	0-3	67 (42.14)	16 (38.09)	51 (43.59)	0.40	2	.820
	4-7	24 (15.09)	7 (16.67)	17 (14.53)			
	8	68 (42.77)	19 (45.24)	49 (41.88)			

The study-time groups were compared on the learner characteristics and the study ratings (see Table 6). Significant differences were only found for prior knowledge, intrinsic motivation, and performance. Long study-time learners showed a higher level of motivation and performance but a lower level of prior knowledge. The ANOVA with repeated measures of prior knowledge and performance revealed a large effect of time, $F(1,157) = 265.48$, $p < .001$, $\eta^2 = .63$, and a medium sized interaction

effect, $F(1,157) = 10.41$, $p < .002$, $f^2 = .06$, showing that the long study-time students gained more knowledge than the short study-time students.

Table 6: Means and standard deviations of the student groups, results and effect sizes are shown. One-sided Welch-tests and t tests were calculated

	Short study-time group			Long study-time group			t	df	p	d
	M	SD	n	M	SD	n				
Age in years	37.55	9.26	42	37.38	8.92	117	.10	70.08	.458	.02
Intrinsic motivation	3.91	.52	42	4.07	.60	117	-1.70	83.91	.046	.28
Computer attitude	4.25	.73	42	4.21	.57	117	.36	59.98	.361	-.06
Computer anxiety	1.82	.78	42	1.81	.61	117	.09	59.85	.465	-.02
Metacognitive strategies	3.45	.58	42	3.52	.53	117	-.62	67.73	.268	.13
Time management	2.46	.91	42	2.53	.91	117	-.42	71.74	.336	.08
Learning environment	4.05	.69	42	4.08	.59	117	-.28	64.43	.389	.05
Prior knowledge	56.10	21.17	42	49.80	11.14	117	1.84	49.39	.036	-.44
Difficulty of content	1.79	.77	40	1.63	.52	111	1.23	52.18	.113	-.27
Difficulty of studying	1.85	.74	40	1.66	.67	111	1.50	149	.068	-.28
Effort/Importance	3.26	.52	40	3.35	.55	111	-.94	149	.176	.17
Pressure/Tension	1.85	.78	40	1.79	.70	111	.49	149	.314	-.08
Performance	77.12	15.17	42	81.20	13.20	117	-1.65	157	.050	.30

Discussion

Two learner groups were formed according to study time for each module. One group completed most of their modules quickly, spending little time studying. Hence, these students likely missed important information that could not be organized and integrated into an adequate knowledge representation. Students from the second group spent reasonably long periods for studying, which allowed an adequate selection, organization, and integration of important information. Evidence for this assumption was found only for performance (Akçapınar, 2015; Akçapınar et al., 2015), which reflects the results of Stiller and Bachmaier (2019) with a sample of trainee teachers. Results from the analysis of learning experience measures (i.e., ratings of content difficulty, studying difficulty, invested effort, and experienced tension while learning) descriptively show lower difficulty and tension ratings and higher effort ratings for the long study-time group, and a tendency toward significance for the difficulty ratings. These results only partially replicate the results by Stiller and Bachmaier (2019). Overall, effect sizes are mostly placed in the small to medium sized range of effects.

Groups also differed in motivation and prior knowledge. These findings are consistent with results on intrinsic motivation (e.g., Grau-Valldosera & Minguillon, 2014; Hart, 2012; Ivankova & Stick, 2007). That is, learners spending more time with studying are more motivated. Overall, this pattern of results is not surprising given that intrinsic motivation is understood to be inherently linked to self-motivated learning (Ryan &

Deci, 2000). The finding that a higher level of prior knowledge contributed to faster study periods could have occurred as a result of the method. A module was deemed successfully completed when a student correctly answered at least 50% of the items in the given module test. Most students of the short study-time group had already met that criterion after the prior knowledge test. Consequently, they might have expected to perform equally well in the module post-test without spending much time studying a module. This procedure might have contributed to faster study times and worse performance.

Unexpectedly, the results are not consistent with empirical results on learning skills (e.g., Hart, 2012; Ivankova & Stick, 2007; Lee & Choi, 2011; Lee et al., 2013), and they do not fully replicate the findings by Stiller and Bachmaier (2019), who found higher metacognitive skills and skills in arranging an adequate learning environment for the long study-time trainee teacher group. One explanation can be found in the working conditions of students. Trainee teachers are assumed to have a higher workload and overall stress in their practical teacher-training period at schools in which planning, preparation, and regulation of their learning and teaching are stressed, thus they might be challenged to use their skills more effectively to integrate a continuing vocational distance-training course into their daily work (Stiller & Bachmaier, 2019). In-service teachers are assumed to feel less workload and stress compared to trainee teachers because of their experience with daily work routines related to teaching and administration. Hence, strategy skills might be less important for experienced teachers to integrate a continuing vocational distance-training course into their daily work.

Overall, the results must be interpreted carefully. Although the sample size was adequate, the distance training modular design, the use of instructional downloadable pdf papers, and the special target group of teachers are all a matter of concern when generalizing conclusions, especially to whole distance study programs. Nevertheless, the present study results are widely consistent with the theoretical approach and empirical evidence reported in the literature.

Study time could be used as a predictor for how students study and thus for identifying students that should be guided to a deep learning approach (Akçapınar, 2015; Akçapınar et al., 2015). Self-reported study times might be especially important when logfiles cannot be used for calculating study times because of, for example, institution security policies or the lack of this kind of information in the files (e.g., for distance learning courses that provide offline instructional material). In general, when logfiles can be used, additional indicators are likely to exist that are related to learning

approaches (Akçapınar, 2015; Akçapınar et al., 2015; Kinnebrew et al., 2013; Lile, 2011). The data used in this study were obtained by a Moodle system that recorded the entry timestamp of course pages.

A problem might arise from trainings that are free to everybody, as was the case for the distance training in this study, which was free to every trainee and in-service teacher. A wide range of motives could lead to course registration and to participation, making it difficult to assess which students are willing to study and complete the course and which students could be targets of interventions. One particular problem with the present training might have engendered a gambling behaviour of students because the hurdle to complete a module was set low by using multiple-choice items of low- to medium-level difficulty that tested for factual knowledge. Thus, students could have tried their luck in succeeding in subsequent module tests with little effort. More challenging tasks might have shifted learners to dropping out. Normally, such tasks cannot be solved by guessing the solutions. Future research could first identify user groups and analyse these groups separately to gain clearer insights about the factors that lead to dropout and learning success.

For practice and research, focusing on combining logfile analyses with an initial diagnostic of relevant learner characteristics and their framework conditions for studying seems promising. Logfile analyses could especially be used to support students in their learning behaviour and to lead them to higher performance, and it might also be used to identify and support students that drop out after having studied parts of a training (Akçapınar, 2015; Akçapınar et al., 2015; Kinnebrew et al., 2013; Lile, 2011). In complex educational environments like study programs, other possible correlates could be analyzed such as academic background, grade-point average, or former distance learning experience and success (Lee & Choi, 2011; Wladis et al., 2014).

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Moody MOOCs: An Exploration of Emotion in an LMOOC

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Best Research Paper Award Winner

Abstract

This paper reports on the emotions experienced by participants of a language learning MOOC or LMOOC. It has been previously shown that emotions play a key role in the learning process. Therefore, identifying and understanding the emotions experienced in new learning environments, such as LMOOCs, is of particular importance. This study was conducted during the first iteration of the Irish language and culture MOOC, Irish 101, which is delivered through the FutureLearn platform. An analysis of both self-report data and in-course learner comments is conducted to identify the emotions experienced during various content steps in the LMOOC. We found that positive emotions, such as curiosity, excitement and pride, were reported most strongly by participants throughout the course. However, certain sections of content evoked comparatively stronger instances of negative emotion such as frustration and confusion. Examples of how these emotions manifested in the discussion posts are also presented. This paper concludes by discussing the potential of emotion research for informing LMOOC design.

Abstract in Irish

Tuairiscítear sa pháipéar seo na mothúcháin a bhraith daoine a bhí rannpháirteach i MOOC foghlama teanga nó LMOOC. Tá sé léirithe go bhfuil baint mhór ag mothúcháin leis an bpróiseas foghlama. Tá tábhacht mhór dá bhrí sin leis na mothúcháin a bhraitear i dtimpeallachtaí nua foghlama, mar LMOOCanna, a aithint agus a thuiscint. Le linn na chéad chuid den MOOC Gaeilge agus Cultúir, Gaeilge 101, a cuireadh ar fáil ar an ardán *Future Learn* a tugadh faoin staidéar seo. Tugtar faoi anailís ar shonraí a thuairiscíonn na rannpháirtithe féin agus tuairimíocht an fhoghlaiméora le linn an chúrsa d'fhonn na mothúcháin a bhraitear le linn na gcéimeanna éagsúla ábhair i LMOOC a aithint. Fuaireamar amach gur mothúcháin dhearfacha, mar fiosracht, ríméad agus bród na mothúcháin

ba mhó a thuairisc rannpháirtithe le linn an chúrsa. Spreag míreanna áirithe ábhair mothúcháin láidre dhiúltacha inchomparáide, áfach, mar frustrachas agus mearbhall. Tá samplaí tugtha freisin de na bealaí ar cuireadh na mothúcháin seo in iúl sna postálacha plé. Ag deireadh an pháipéir seo déantar plé ar an bpoitéinseal a bhainfeadh le taighde ar mhothúcháin chun leagan amach LMOOC a chur ar an eolas.

Keywords: learner emotions, online language learning, MOOC, learning design, mixed method

Introduction

For a long time, emotions were considered to be outside the realm of rational thought and thus systematically ignored in educational research. In the past few decades, however, educational science has been experiencing an affective turn (Pekrun & Linnenbrink-Garcia, 2014). Increasing interest in emotions in education has emerged in the literature following recognition of the inextricable link between cognition and emotion. Subsequent research has proven that emotions have a significant impact on learning achievement (Pekrun, Goetz, Titz, & Perry, 2002). Despite this progress, there remain many learning contexts where the relationship between emotions and learning is less understood.

Massive Open Online Courses (MOOCs) are online instructional platforms that have grown in popularity in the past decade, in particular among higher education institutions. In 2017, over 800 Universities around the world had launched at least one MOOC (Shah, 2018). The high expectation associated with the influx of MOOCs into higher education has provoked a burst of research focused on improving pedagogical and technical approaches in order to maximise their effectiveness. While the majority of this research has been student-focused (Veletsianos & Shepherdson, 2016), the affective dimensions of learning have not received as much attention in MOOC research. The role of emotion in online learning contexts such as MOOCs is of particular importance considering the regulatory role of instructors in face-to-face environments and the corresponding lack of such support for online learners. The role of a teacher involves understanding and responding to student emotional patterns (Mayer, 2004), providing assistance and reacting to prompts. In comparison, online instruction, even when synchronous, relies on a delayed form of reaction. A far greater reliance is placed on adequate design, appropriate pedagogical foundations and ensuring frequent contact with instructors.

Initial investigations of emotion in a MOOC context have used MOOC discussion forums (Wen, Yang, & Rosé, 2014) and click stream data (Leony, Muñoz-Merino, Ruipérez-Valiente, Pardo, & Kloos, 2015) to infer student emotion. Dillon et al. (2016) however, utilised a self-report approach, giving voice to the student and the subjective nature of emotion. They investigated student emotion during an introduction to statistics MOOC, obtaining self-report data at multiple points during the course. The current paper reflects this approach, addressing key questions about student emotion in a language learning MOOC (LMOOC). Learning a language is not comparable to learning other subjects. This is mainly because of the social nature of such a venture. The process is not only knowledge-based but mainly skill-based, requiring interaction with other speakers and the use of higher order thinking skills, not just memorisation and mechanical reproduction (Bárcena & Martin-Monje, 2015). As a result, facilitating the acquisition of language-specific skills is a significant challenge in an online context, in particular in a MOOC context which consists of potentially thousands of heterogeneous students and templates that promote a transmission-based approach to learning. However, as Sokolik (2014) points out, the infancy of LMOOCs presents us with an opportunity to “get it right”, informed by the mistakes of the past. A greater understanding of learner emotions in an LMOOC context could enhance this process.

The Current Study

This study explores the presence of emotion in the Irish language MOOC, Irish 101, provided by Dublin City University in Ireland, through an analysis of self-report data and discussion forum posts.

The following two research questions will be addressed:

- What emotions do learners self-report when engaged in an LMOOC?
- Is there evidence of these emotions in course discussion posts?

Method

Learning Environment

We conducted this study during the first iteration of an Irish language and culture MOOC, Irish 101, which is hosted by the FutureLearn platform. This MOOC is offered by DCU as part of the Fáihte ar Líne (Welcome Online) initiative. This project is co-funded by the Irish Government, specifically the Department of Culture, Heritage, and the Gaeltacht, under the Twenty-Year strategy for the Irish Language,

with support from the National Lottery. The course was designed for *ab-initio* learners of the Irish language. It began in January 2018 for three weeks, consisting of approximately 4 hours of learning per week. The content each week is broken down into 32 steps on average and these steps are grouped under various themes such as greetings, hobbies, giving directions etc.

Procedure

An experience sampling approach was used to collect self-reported data pertaining to learners emotions during the course. Following various steps, learners were prompted to self-report on the emotions they experienced while learning during that step. The survey appeared as a link within the step. It was intended that the immediacy of the measurement would reduce the retrospective bias inherent in self-report data. There were 6 data collection points per week (18 in total). All responses were anonymous and participation was optional.

An analysis of discussion forum posts for two exemplar steps was then conducted to identify if, and how, the emotions identified by the survey were expressed by participants during these steps. This qualitative analysis of learner comments was intended to supplement the survey results and provide important contextual information that addressed some of the limitations of the quantitative instrument, in particular, the lack of subjective articulation of emotions. It also opened up an avenue to explore the reasons why learners expressed these emotions. This multiple methods approach was ensured that the research was "...inclusive, pluralistic and complementary" (Johnson & Onwuegbuzie, 2014; p.17). Ethical approval for the study was obtained from DCU's Research Ethics Committee in January 2018 (DCUREC/2017/205).

Emotion Measures

Survey Instrument

The short version of the Epistemic Emotion Scale (EES) developed by Pekrun, Vogl, Muis, and Sinatra (2017) was used to assess students' learning-related emotions due to the fact that it is minimally invasive and thus suitable to an experience sampling approach. This version of the scale contains one item per emotion, measuring a total of 7 emotions: *surprise*, *curiosity*, *enjoyment*, *confusion*, *anxiety*, *frustration* and *boredom*. Adaptations to the scale to account for an Irish language learning context included the addition of a further four emotions: *hope*, *hopelessness*, *pride* and *anger*. These, and the other emotions on the scale, were found to be relevant to Irish language

learning during prior research conducted by the study's team. The final scale investigated eleven emotions. Participants responded to each item using a 5-point Likert scale in which they were asked to indicate how strongly they felt the emotion from 1 = *not at all* to 5 = *very strongly*. Contextualised instructions were included to address each task type.

Discussion Posts

At the end of each step in the course, learners had the option to contribute to a discussion forum. One exception to this was during quiz steps. Comments posted in the discussion forum for two exemplar steps investigated by the survey were downloaded and coded as positive, negative or neutral. They were then further categorised into subject themes which allowed researchers to identify contrasting and supporting evidence for the survey results.

Findings

Survey Results

Of the 10,464 people who enrolled for the course, 2931 learners completed the survey at least once during the course. The emotion felt most strongly by participants during the course was *Curiosity*, with over 55% of respondents reporting *Strong* or *Very Strong* instances of curiosity. This is followed by *Excitement* (32%), *Hope* (28%) and *Pride* (26%). Figure 1 presents a breakdown of the reported emotion over the 18 data collection points. Notably, emotions varied with regard to different sections of content during the course. Curiosity, while remaining the emotion reported most strongly by participants throughout, experienced a gradual decline over the course. Step 2.15 (cultural article about place names) proved to be an exception to this as curiosity increased significantly during this step. Following a sharp decline at the beginning of the course, other positive emotions such as excitement, pride and hope remained relatively stable throughout the course. Mirroring curiosity, these positive emotions were also experienced strongly by participants during step 2.15. Step 3.10 (Vocabulary for giving directions) also evoked positive emotions among respondents. The strong presence of positive emotion is comparable to the results of the Dillon et al. (2016) study. They found that the positive emotions of Hope and Enjoyment were the most frequently reported among the participants of their statistics MOOC.

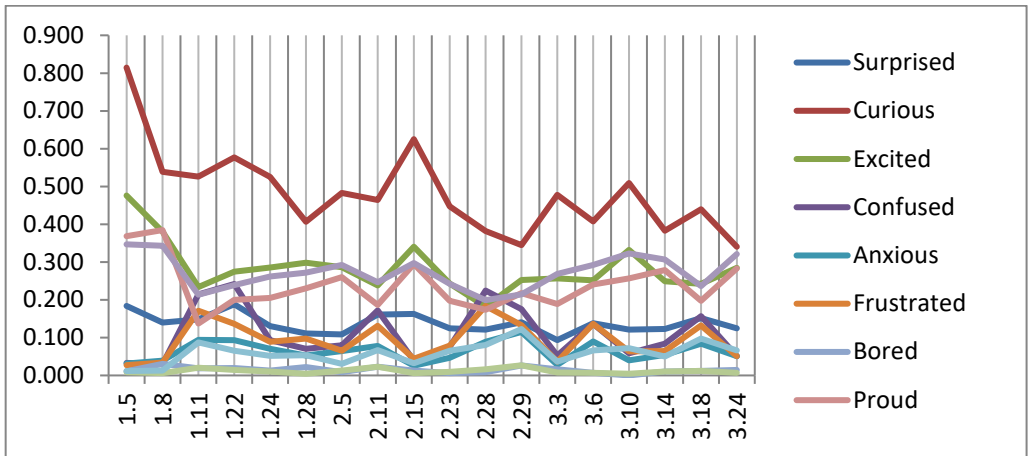


Figure 1. Distribution of emotion over course

While positive emotion dominated throughout, some content evoked comparatively stronger reports of negative emotion. For instance, the percentage of participants identifying strongly with confusion increases 7-fold, from 3% to 21%, during step 1.11 (Conversation Video) compared to step 1.8 (Quiz) of the course. Again during step 2.28 (Grammar Quiz) strong reports of confusion increased significantly when compared to the previous steps investigated. Interestingly, other negative emotions such as anxiety, frustration and hopelessness follow the same pattern to varying degrees during these steps. These spikes in negative emotion also correspond with drops in the reports of strong positive emotions during the same steps.

These survey results highlight that learners experience certain emotions more strongly during different sections of content in an LMOOC. In order to explore these results further, two steps were selected for specific comment analysis due to their distinctiveness among the survey results. Step 1.11 was chosen for its comparatively high negative emotional reaction, particularly following mainly strong positive emotion reports prior to that step. Step 2.15 was selected for its particularly strong positive emotional trend. For a description of these steps see Table 1.

Table 1: Description of steps

Step Number	Week	Task Type	Description
1.11	1	Video	Introduces participants to a basic conversation in Irish. Two people introduced themselves to each other in Irish.
2.15	2	Article	Cultural piece, explaining the links between the Irish language and place names in Ireland.

Discussion Post Interpretation**1.11 Conversation Video**

The survey results indicated that this step provoked comparatively strong reports of negative emotion. Despite this, curiosity and excitement were still the emotions reported mostly strongly by respondents. The analysis of learner comments during this step, however, identified predominantly negative posts from learners. Many expressed concern that the video content was too difficult, referring to pronunciation and the speed of the conversation. Reference was also made to non-linguistic aspects of the video such as the long introduction and background music. Interestingly, this was one of the first interactions learners had with a linguistic task which in this case was listening. Previous steps consisted of introductory blocks of grammar and culture.

“Found this video a little too fast, also would like know what they are saying.” (Learner A)

“A lot of intro and music to a very fast conversation. Not very helpful to a novice.” (Learner B)

“Perhaps the jump from single words to quickly spoken sentences is a little sudden? Slowing down the interaction just made them sound very strange.” (Learner C)

The comments also indicated that some learners returned to the step having completed successive steps in which the linguistic elements of the video were explained in more detail. This highlights the importance of how activities are structured for learner understanding.

“Just realizing all these phrases are explained in future lessons...” (Learner D)

Finally, it is also important to note the role of learner interaction during the course, with many participants encouraging each other, suggesting that learners potentially play a role in regulating emotions.

“Good job! I can’t do that yet” (Learner E)

2.15 Cultural Article

In contrast to the difficulties found in step 1.11, step 2.15, in which learners explored Irish language place names, showed strong increases in positive emotions, such as curiosity, excitement and pride. Learner comments pointed to several possible reasons for this, such as intrinsic enjoyment of the task:

“The Irish place names are quite fascinating as they have history and location built into them” (Learner F)

Contextual application of the knowledge in the step to existing learner knowledge (the step prompted learners to talk about their own home-places and their lexicological origins):

“A very interesting section. Caloundra where I live in Australia is on the coast. The word Caloundra is an Aboriginal word meaning ‘place of the beech tree’ or ‘Callanda’ a beautiful place, which it is.” (Learner G)

A general enjoyment of the discussion relating to place names:

“A fascinating section. Love all the comments” (Learner H)

A mixture of both pride and aesthetic appreciation of the language:

“It strikes me how lyrical and visual the original place names are” (Learner I)

This strong positive reaction speaks to the potential usage of cultural teaching embedded within grammatical tasks as a way of provoking strongly positive responses and engagement from learners.

Conclusion

Identifying the emotions experienced within LMOOC environments is an important task. Our results show that learners experience a variety of both positive and negative emotions while learning with different types of content in an LMOOC. We also found that broadly positive and broadly negative emotions appear to move in tandem. At a macro-level, the results show that Curiosity is the emotion participants felt most strongly; however, it is within the variation of the less commonly reported emotions that the, arguably, more valuable findings emerge.

There are a few limitations in this study. Firstly, we acknowledge that our results may be biased by the high rate of attrition in the MOOC. This was reflected in survey responses and course activity. Secondly, due to the anonymity of the surveys it was not possible to determine whether the survey sample reflected the participants who contributed to the discussion forums in the course, although some overlap is likely.

Our analysis points to several implications for LMOOC and also MOOC design more generally. Significant diversity was found in learner emotions, pointing to the need for designers and instructors to understand these distinctions and their potential role in learning at a distance. Furthermore, the analysis of discussion forum posts proved useful in identifying the reasons why learners experienced certain emotions. This highlights some of the benefits of qualitative research in a field that to date has been dominated by quantitative studies. Further research with regard to emotion antecedents would be beneficial in informing teaching strategies and interventions that encourage positive emotions during learning in a MOOC environment.

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The Experience of Distance Learners as Writers

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Summary

In 2016, we (Edirisingha & Wood, 2018) attempted to develop provision for distance learners on an MA in International Education through the use of a modified version of lesson study, an approach affording the opportunity to consider student learning and practice development (Wood & Cajkler, 2016). One area of student need which became clear in this work was the difficulties experienced by some students in relation to academic writing. Being remote from support, relying heavily on electronic resources with little access to extra support which those on campus-based programmes take for granted, we decided carryout this initial investigation to understand the experiences of these learners as academic writers working at a distance.

Introduction

Whilst distance learning has become an established field of research for practice development, there is relatively little research focusing on the experiences and approaches to writing undertaken by students. Academic writing is the focus of a very large literature, but this predominantly focuses on grammar and structure of writing, as in the English as Academic Practice (de Chazal, 2014), and the emotional impact of the writing process (Huerta, Goodson, Beigi, & Chlup, 2017) rather than understanding the processes utilised by students when writing for assessment purposes.

We were interested in exploring the following questions to focus a preliminary investigation into some of these issues:

1. What is the role of technology in the process of academic writing for distance learners?
2. How do distance learners approach academic writing as a process?
3. What forms of support are used by distance learning students to support their writing?

The programmes we focused on were to masters level programmes in an education department at a UK university. The majority of students were full-time teachers and academics undertaking the programmes whilst in full-time employment.

Methodology

To carry out an initial exploration of student experiences of writing, a simple explanatory mixed methods approach was used during the winter of 2017. After obtaining ethics approval from the university ethics committee, all students on an MA in International Education (n = 50) and those on a Post Graduate Certificate in Educational Technologies (n = 17) were e-mailed a link to an online questionnaire (Table 1 shows the questionnaire items) together with an invitation to take part in the study and were asked to complete it if they wished. The questionnaire was wholly optional, and it was made clear to students that its (lack of) completion was not linked in any way to their work on the course. Students were asked to include their e-mail address if they were willing to be interviewed online subsequent to completing the questionnaire. In the questionnaire students There were 28 returns (response rate = 42%). Based on an initial analysis of these returns, a set of interview questions (Appendix 2) were developed. The interview text was sent out as an e-mail to complete as an online interview (James & Busher, 2009). Due to time restrictions and the period over which the returns were made it was not possible to send out follow-up questions in a second round of questioning as would normally occur in the online approach to interviewing.

The data were collated for simple descriptive analysis in the case of the questionnaire data, and the interview data were analysed using emergent coding to create a set of basic themes from the data.

Questionnaire Findings

The summary of the results from the Likert Scale items of the questionnaire are shown in Table 1 below.

Table 1: Summary results from questionnaire focusing on the experience of distance learners in relation to writing

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
I write using an electronic device (e.g. laptop, tablet) rather than on paper	21	7			
I frequently look at online videos from the course when developing academic writing	9	9	5	3	1
I tend to write by just fitting it in with my work commitments	7	10	7	2	2
I find academic writing stressful	3	12	7	6	
I prefer to write alone, but share drafts with others on my course for comment	7	12	4	4	1
My past experience of writing makes me a confident academic writer	3	10	7	8	
I tend to write when I have a long period (at least half a day) to focus on my writing	13	10	3	2	
I am able to create a coherent argument in academic writing	2	19	6		
My first degree required me to complete written assignments	20	4	1	3	
I make a lot of use of online library resources	24	3	1		
I tend to write in short (1-2 hours) bursts on a regular (3-5 times a week) basis	4	4	4	15	1
I had explicit training in writing assignments in my first degree	1	6	3	9	9
I prefer to write with others, sharing and discussing ideas	1	7	11	8	1
I don't have much confidence when developing academic writing		10	6	12	
I am able to develop critical written commentaries in my writing	1	15	11	1	
I search for and read material for assignments using an electronic device	27	1			
I frequently look back at notes and past readings when developing academic writing	17	8	2	1	
I tend to use any spare time I have to write regardless of duration or frequency.	6	4	5	10	3
I enjoy the challenge of writing, even when it is difficult	8	14	5	1	
I am able to structure a well written assignment	2	19	6	1	
I prefer to write alone, only sharing draft work with a tutor	3	10	8	7	

The results from the questionnaire show that there is a ubiquitous use of technology in the assignment writing process. Students identified that they tend to make more use of tablets, particularly iPads (students on the MA International Education programme are given a complementary iPad when they start the course), for searching for literature and reading that literature once found. This appears to extend to reading on screen rather than downloading and printing off papers for analysis. However, whilst

the portability of tablet computers for searching and reading are highlighted, when it comes to writing, there is a greater tendency to use laptop computers. Some students also mention particular Apps at this point, with five students identifying that they hold written drafts on Google-Docs, and 4 students identifying their use of Grammarly for checking and ensuring a good quality of written academic English.

Time is also an issue which appears to be important for students in their writing experiences. Most identify a preference for writing alone, perhaps unsurprising for a distance-learning medium, although a small number of students do state in answers to the later, open questions in the questionnaire that they have found informal collaboration has been a useful part of their work, an observation which is duplicated in the subsequent interview returns. Working alone appears to be an important aspect of their writing experience as many of the respondents identify a need to fit their academic writing around their professional responsibilities meaning that they create personalised rhythms for their writing process. This also means that they are often having to find time in-between other activities. This may lead to a less satisfying experience as the majority of students admit that they do not like writing for short bursts of time. Rather the clear majority prefer to spend extended periods (at least half a day) focusing solely on their writing. This appears to suggest that finding time to write is a major challenge for this group of distance learners.

The students appear to be confident about their writing abilities, but also admit that the process of writing is a challenge. However, a number of those replying to the questionnaire who are close to finishing their courses do state that they feel that they have learned a great deal about academic writing and generally feel more confident than they did at the beginning of the programme.

The main challenges which writing presents appear to be related to features of distance learning itself. Some commented on the lack of physical resources due to their remote location, for example not being able to easily obtain paper resources such as books which exist in the university library, but which are not held in an electronic format. Two students commented on the lack of immediate tutor availability that can lead to anxiety, which relates to a comment from another student regarding feelings of isolation. The other reflection which came from three students relates to the support given online for assignment writing. Two exemplar assignments were made available but there was little deconstruction of the elements within those assignments or commentary to help students understand the reasoning behind the grades the assignments had been given. This meant that whilst they might be able to deduce

elements such as structure and general issues around composition, referencing etc, there was little guidance to help understand the relationship between attained grade and mark schemes or deeper reflections on the detail of the assignments.

Interview findings

The questionnaires led us to focus on several themes in the online interviews:

- time;
- resources;
- networking with others;
- the nature of criticality.

Students found that there were a number of tensions in completing academic work whilst in full-time teaching. Most outlined how they created a clear rhythm in their writing activity, which helped them work productively, often by using set periods of time. For example, Respondent 1 stated,

“As I am working full time I would allow myself a two- hour break after arriving home and then would work for a few hours every other day during the week, as the other evenings would be spent for paperwork for work. I would then typically set aside either two half days at the weekend or one full day, so that I could still meet up with friends.” (Respondent 1)

This appears to reflect the questionnaire returns which showed that students prefer to find longer periods of time to immerse themselves in writing as opposed to merely fitting it in at points when they find they have often small, spare periods of time. However, for some students the writing process is much more difficult as they highlight that they are not only challenged by the amount of professional work they have to complete alongside their studies, but also the pressures of family life, for example,

“It is not easy to manage, so what I do sometimes is wake up very early to read and write and sometime also stay very late to do same. I have to give my family time in the evening to engage with them and during the day time, I have to be at work full time which did not give me time to do anything about my study or assignment.” (Respondent 3).

One interesting aspect of the interview returns was that whilst the questionnaires had suggested that students tended to work alone on their assignment writing, the interviewees gave rich reflections on the networks, predominantly informal in nature, they had relied on when writing assignments. For example, Respondent 2 outlines a number of collaborative activities, from discussing potential topics, to sharing papers. Hence, networks of support were being developed away from the formal structures of the course.

“I worked with others somewhat during my writing process. Initially, this involves informal conversations with other students regarding our topics and using each other to informally explore ideas we were considering. There was also the occasional sharing of an article that was relevant to another student’s topic. This stage was very useful as it allowed me to get feedback regarding how interesting my topic was to other people in the field and course plus it allowed me to discuss the topic and have other people provide other avenues for me to explore.” (Respondent 2).

Resources from the course were also used to support writing. More than one interviewee highlighted the utility of the exemplar assignments which had been made available, for example, Respondent 4 stated,

“I think the examples of proper and successful writing were extremely helpful as they give you an idea of what should be done at this level of academic writing.” (Respondent 4)

Again, this is in contradiction to some of the open responses from the questionnaire, but there may be a level of self-selection bias in the replies from the interviewees. Indeed, there is clear evidence that whilst the exemplars were seen as a useful resource, further contextualization and explanation of them in support of writing would be very useful.

Some respondents also discussed how they had integrated the weekly work activities from their studies into their writing process, showing that they were making direct use of the information and resources to inform their assignment writing.

“I relied on the weekly material a lot, in order to inform an understanding of the module which would lead to the choice of topic. I also used the resources listed on the module, both to write my assignments and as a starting point to research more articles by the same authors or on the same subject.” (Respondent 5).

Two respondents also highlighted the importance of contact with tutors as a resource, and in one case (Respondent 1) suggested a way of using this resource more productively to help students in their writing,

“It would be very helpful to perhaps have a time slot (I know this is challenging on a distance learning course due to time zones) whereas students we could have a form of question time with some of the tutors from the course.” (Respondent 1).

Finally, we included a question relating to criticality as we reflected that this is a major focus of writing at masters level, but that there is often an assumption that students understand what it means and how to integrate it into writing without ever understanding if this is actually the case or not. Two respondents left the question unanswered which may indicate a lack of confidence, whilst Respondent 3 gave a useful, simple definition.

“I would define Criticality as an in-depth understanding of a particular work concept, which leads to questions as to why the writer is developing his/her writing in such a way, and facts that surround it.” (Respondent 3).

This suggests, alongside previous research we have conducted (Edirisingha & Wood, 2018), that greater support is required for helping distance learners explore the meaning and application of criticality in their writing, a focus which we think may often be ignored in programme materials.

Initial Reflections

Little is known about how distance learners approach their written work, especially in terms of use of resources, the temporal aspects of how written work can be intertwined with professional and personal responsibilities, and how they can best be supported to enable them to reach their academic potential. The initial insights gained from this small-scale study suggest a complex picture of highly differentiated ways in

which individuals choose to work. They manage their time in different ways to fit with the idiosyncratic pressures they experience. There is also a spectrum of resource and support use, with some students preferring to work in a very individualistic manner, whilst others begin to form informal support networks. Some students make extensive use of the course resources as a foundation for their work whilst others do not. It is also the case that further support resources are required to help students to fully understand what is expected of them and how to develop their academic writing.

The main elements of the process which show a level of similarity across the cohort are the development of positive working relationships with tutors who are seen as crucial in supporting the writing process, and the ubiquitous use of technologies. However, on this latter point, there is a tendency to assume students know how to make use of technologies to greatest effect, but do we need to consider how to support better, and more critical use of technologies to support writing processes?

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Appendix 1 Questionnaire

Demographics					
Which subject did you study for your first degree?					
How would you describe your current job role?					
How long have you been employed within education or associated fields?					
Prior learning					
	SA	A	A/D	D	SD
My first degree required me to complete written assignments					
I had explicit training in writing assignments in my first degree					
My past experience of writing makes me a confident academic writer					
Technology					
I write using an electronic device (e.g. laptop, tablet) rather than on paper					
I search for and read material for assignments using an electronic device					
Please list any technology you use whilst writing an assignment (include for what purpose in each case)					
Individual to social process					
I prefer to write alone, only sharing draft work with a tutor					
I prefer to write alone, but share drafts with others on my course for comment					
I prefer to write with others, sharing and discussing ideas					
Resources					
I make a lot of use of online library resources					
I frequently look back at notes and past readings when developing academic writing					
I frequently look at online videos from the course when developing academic writing					
Development of writing					
I am able to structure a well written assignment					
I am able to create a coherent argument in academic writing					
I am able to develop critical written commentaries in my writing					
Affective elements of writing					
I enjoy the challenge of writing, even when it is difficult					
I find academic writing stressful					
I don't have much confidence when developing academic writing					
Rhythms of writing					
I tend to write when I have a long period (at least half a day) to focus on my writing					
I tend to write in short (1-2 hours) bursts on a regular (3-5 times a week) basis					
I tend to use any spare time I have to write regardless of duration or frequency.					
I tend to write by just fitting it in with my work commitments					
Please give a very short account of the positive aspects of your experience of writing your first assignment					
Please give a very short account of the challenges you have experienced in writing your first assignment					

Appendix 2. Interview text and questions

Dear student

Thank you for including your e-mail in the recent questionnaire focusing on experiences of writing as a distance learner. If you are still happy to answer some interview questions that would be great, the instructions are below. If, however, you have now decided not to take any further part in our research, please feel free to stop reading now.

We have included a participant information sheet and an informed consent form (attached) and would ask you to have a look through and sign the consent form if you choose to carry on (an electronic signature is fine).

Below are seven interview questions. You are free to answer these questions either as written responses in a return e-mail, or as a voice recording if you have the kit to record a voice file. Whichever is easier for you. Once you have either typed or recorded responses, please send them to us. The data will obviously be treated confidentially, and any reporting will be either aggregated or anonymised. Once we have analysed your responses, we may want to send through a couple more questions for clarification, but again your decision concerning involvement can be revisited again at that point.

Interview questions.

1. Over the period during which you developed your assignment, please describe your general pattern of work (e.g. did you read and then write, did you read and write in cycles, etc.).
2. How did you work with others, if at all, during the writing process? If you did, what do you think are the advantages of sharing ideas and work?
3. Please describe the nature and impact of any networks of support you engaged with during the writing process?
4. How might the exemplars offered to you be developed as a helpful resource for writing?
5. How did you try to manage the time tensions between full-time work and academic study/writing?
6. If you used the materials from the weekly work packages to inform and help with your assignment writing, how did you do this?
7. How would you define the concept of 'criticality' and how has the writing of your first assignment helped you develop this part of your work, if at all?

University Teacher Skills and Attitudes to Create and Use Open Educational Resources

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Abstract

Open Education Resources (OERs) are not a new phenomenon; however, it is still indolently used in higher education curriculum. Although it can bring new ideas for learning and teaching, motivate students, help them learn better, and prepare more attractive curriculum, the usage and development of OERs can be challenging. Using OERs in university curriculum, it is important to find out, what is the attitude of university teachers towards OER, their use and creation? What are the skills of university teachers to create and use OER? These were the main research questions of this research. In order to answer the research questions, the design-based research and semi-structured interviews were used. The preliminary results of research findings show that university teachers are not sure if they have the skills for OER development and don't feel the need to share all created resources.

Abstract in German

Open Education Resources (OERs, "Offene Bildungsressourcen") sind kein neues Phänomen; dennoch werden sie bisher in der Hochschulbildung nur zögerlich genutzt. Obgleich sie das Potenzial bergen, neue Ideen für Lernen und Lehre zu generieren, Studierende zu motivieren, sie beim Lernen zu unterstützen und Lehrinhalte attraktiver zu machen, können ihre Entwicklung und ihr Einsatz herausfordernd sein. Für die Nutzung von OERs in der Hochschullehre ist es daher wichtig, herauszufinden, welche Einstellungen Lehrende zu OERs, ihrem Gebrauch und ihrer Erstellung haben. Welche Fähigkeiten haben sie in diesem Bereich? Dies sind die leitenden Fragestellungen dieser Untersuchung. Um sie zu beantworten, wurden Design-Based Research und semi-strukturierte Interviews durchgeführt. Die vorläufigen Ergebnisse zeigen, dass Hochschullehrende unsicher sind, über die notwendigen Fähigkeiten für die Entwicklung von OERs zu verfügen und nicht das Bedürfnis verspüren, alle erstellten Materialien mit anderen zu teilen.

Keywords: open educational resources, higher education, open education, distance learning, teacher skills, attitudes

Introduction

Open educational resources (OERs) are not a new phenomenon and traditionally are described as

“any type of educational materials that are in the public domain or introduced with an open license. The nature of these open materials means that anyone can legally and freely copy, use, adapt and re-share them. OERs range from textbooks to curricula, syllabi, lecture notes, assignments, tests, projects, audio, video and animation”.
(UNESCO, 2019).

OER use in education has been analysed from different perspectives – as possibility to open curriculum (Dalsgaard & Thestrup, 2015; Rolfe, 2017); development and integration in university curriculum (Allen & Seaman, 2014); impact on teaching or learning (Bodily, Nyland & Wiley, 2017) and students’ satisfaction. However, OERs are still indolently used in higher education curriculum as teachers lack time, skills, attitudes and incentives for OER creation or search and use (Allen, & Seaman, 2014; Guo, Zhang, Bonk, & Li, 2015).

“Opening up education requires a change in attitudes and mindset”
(Ossiannilsson, Altinay, & Altinay, 2016; p.159).

The development of high quality OER could be seen as a tool for marketing institution and its courses (Comiskey, McCartan, & Nicholl, 2013). However, the use of OERs in university curriculum may also contribute to the reflection of educators (Elf, Ossiannilsson, Neljesjö, & Jansson, 2015) and sharing of their practices. Allen and Seaman (2014) research revealed that although university teachers indicate OER discoverability and evaluation as the main barriers while searching for and selecting OER, the discoverability rate of OER, compared to discoverability rate of traditional resources was very similar.

Wiley, Williams, DeMarte, and Hilton (2016) indicate the following challenging activities for institutions and teachers while integrating OER into university studies: time spent for searching and finding a proper OER; knowledge and use of open licenses; effective integration of OER into learning practices and university learning

management system, as this may require additional tools, plugins, software, ICT skills. Blessinger and Bliss (2016) provide the results of teacher's time for course preparation with usage of OERs textbooks: more than half of the teachers reported that they spent more time preparing course with OERs than in the past. However, despite of course preparation time, teachers see some advantages, such as OER online books are available from the first lecture, all students have access to it, and learning can start from the beginning of the class.

Trainings and systematic development of teacher skills are needed for successful OER use in university curriculum. Armellini and Nie (2013) suggest that teacher trainings should cover: identification of repositories with qualitative and subject-specific OERs; developing teacher skills for OER creation using different software and tools; practicing the skills regarding use of copyright and licensing; providing guidance on possible OER formats, size; and sharing developed OERs as good practices. However, the lack of teacher skills could be significant obstacle for OER creation. Guo, Zhang, Bonk & Li (2015) indicate 5 groups of OER development and usage barriers, stressed by university teachers from China – (a) content, (b) experience, (c) institutional, (d) interface, and (e) habit (of online learning). Besides, teacher attitude towards OER occupies a prominent place when choosing whether to use OER, while preparing curriculum.

Thus, with this research we aim to identify university teacher attitude towards OER and their skills to create and use in the curriculum. The research questions are: what is the attitude of university teachers towards OER, and their use? What are the skills of university teachers to create and use OER?

Research methodology

Qualitative research is based on induction and description of results; its purpose is to study and understand complex phenomena with their characteristics, and to present various meanings and attitudes about the investigated phenomenon from the perspective of participants (Merriam, 2002; Creswell, 2007; 2009; Flick, 2009; Žydzūnaitė & Sabaliauskas, 2017). The lack of research on the university teacher skills and attitudes towards the use of OER, on the needs for the change of high education curriculum towards open online learning, and the use of OER in university curriculum, and focus on responding to the learning needs of digital and network society, has led to the selection of a qualitative research paradigm that helps to understand human experience, and to reveal the subjective meaning and

interpretation of instances of individual experiences without isolating them from the context. In order to answer the research questions the theory analysis and design-based research were used.

Data collection and research participants

During the first research stage a semi-structured expert interviews with three open-ended questions (about the characteristics of open online learning curriculum, its change and impact on learning process, and finally on OER impact for open online learning curriculum in HE) were used for collecting data from education experts and indicating the main areas of concern and deeper analysis of the focus for further research. The interviews were recorded with the permission of participants; and essential aspects of the interview or further questions were noted in the researcher's diary. At this stage of the research, the questions for experts were constructed on the basis of theoretical findings and orientated towards research questions.

In this study, the selection of interviewees was used to select those who are most familiar with the research problem and can provide detailed information on needs for the change of open online learning in high education, considering skills, needed for OER creation and use, and integration into the university curriculum. The target selection of interviewees was based on the criteria:

- international expert in open and online learning;
- having at least 10-year expertise, implementing open and online learning in higher education.

The researchers interviewed 13 international experts, based on the fact that such an interview would help to obtain enough meaningful information for research, which would help ensure data saturation. The study involved 7 women and 6 men aged 25-60, with experience in the open online learning from 10 to 18 years, from 8 countries, ranging from policy level experts up to practical application teachers and researchers in universities and companies.

Based on the interview findings, a design-based research was prepared. It was started with the state of art survey, which included an ATOER scale (developed, tested and validated by Mishra, Sharma, Sharma, Singh, & Thakur, 2016) for assessing the attitude of Lithuanian teachers towards OER. This teacher attitude survey was one of the initial design-based research steps, and it was followed by OER creation (in the form of openly shared slides under the CC BY SA licence) and integration into

curriculum, all taking place and under suggested scenario, then curriculum testing and analysis of the findings. The survey including ATOER scale was used twice: first, with teachers having little experience in creating OER, and repeated with the same teachers after they've created OER. The next steps of design-based research are planned to be followed by teacher focus group discussions, student surveys, and teacher interviews on their experiences in creating and sharing OER, integrated into curriculum.

This initial state of art survey of design-based research was performed with 30 Lithuanian teachers (15 university teachers and 15 VET teachers) who filled in the survey after participation in the trainings on how to create OER using suggested OER creation platform in April 2018. From April 2018 to August 2018 the teachers created OER and integrated them into curriculum using provided scenario. The second survey on teacher attitude and skills was launched in September 2018, it included the same ATOER scale to indicate if there were any changes in teacher attitude towards OER, sharing and adaptation. Teachers were testing the curriculum (with integrated OER) from September 2018 to January 2019.

Data analysis

Qualitative data of the semi-structured interview were analysed through thematic analysis, based on the steps documented by Braun and Clark (2006; 2013) and provided with guidance in applying the six-phased method (Nowell, Norris White, & Moules, 2017): (a) Familiarizing with data; (b) Generating Initial Codes; (c) Searching for Themes; (d) Reviewing Themes; (e) Defining and Naming Themes; (f) Producing the Report.

Certain preliminary broad theme nodes were provided to describe the phenomenon of research, however, the data was essentially processed on the basis of the inductive research logic, since the underlying themes and subthemes were formed directly from the results of the empirical data. In other words, the empirical data were specified and supplemented with preliminary nodes of the themes, discovering themes from the data itself.

The study was initially guided by the principle of volunteering (Allmark, 2002; Flick, 2009; Smith, Flowers, & Larkin, 2012), an email agreement was received from the participants to participate in the interview. The investigation was confidential (no one except the researcher cannot use information provided) and anonymous – without

disclosing the identity of the participants in the investigation (Allmark 2002; Creswell, 2007; 2009; Flick, 2009; Smith, Flowers, & Larkin, 2012).

The initial teacher survey data were summarized and analysed using MS Excel to indicate state of art of teacher approach to OER, noting the tendencies and comparing the differences of VET and university teacher approaches. The data analysis of this survey is going to be followed by statistical analysis in the second round, when the second survey results are available. The data from the second teacher survey will be analysed and used to indicate the change in teacher approach and skills for OER creation, after the experience of OER creation and integration into curriculum.

Research findings

The thematic analysis of semi-structured interviews revealed that universities are changing and they need to change –

“universities have to adopt to processes like accreditation” (I7) and recognition of open content (I8);

“from educational perspective we need to be open to the source of changes that are going on” (I8); “universities are not organized around the needs of students” (I9).

Experts stressed that “every change has to come from inside the educators” (I12) and the change in curriculum is important, necessary (I7) and going on (I3, I5). It was pointed that teachers and the curriculum they deliver need to change to adopt to learner needs and other processes, driven by technologies and openness (I5, I9, I11, I12, I13).

“As sharing is one of the key features of the digital society, the role of OER is increasing. It is important not to repeat and not to “rediscover the bike”, but to use what has been found and has already been done” (I1); “Do not design new Simon. If you know exactly that the Simon already exists, just use this Simon, and say thank you to the person that you can use this...” (I5).

OER impact was noted to be important (I3, I4, I7, I8, I11), but still not sufficient (I3, I4, I5, I9, I11, I12), or “even very very little” (I9) – “OER is slowly arriving” (I5), but it has still not reached the mainstream (I5, I10). Experts also mentioned that there are

existing forces that want to prevent from this change (I8, I2) that OER are bringing. Raising teacher awareness on OER (I10) and transforming their “way of thinking” (I11) was emphasized. The insights of different teacher patterns of using educational materials (I2, I8, I9) and attitudes towards OER (I2, I10) were also underlined by experts, leading to thorough research in the topic.

Initial Lithuanian teacher survey revealed that most teachers, selected for OER creation and development had a positive attitude towards OER and sharing, noticing that VET teachers had more positive attitude than university teachers. It was revealed that 80% of the teachers thought that “It was a pleasure if someone adopted or adapted their educational resources” and most of them (73%) agreed that sharing enhances their personal and organizational reputation. Also, it was positively assessed that sharing of educational resources increased teacher profile amongst peers and others, and that OER increased the network and sphere of influence, promoted collaboration, and sharing OER encouraged others of doing so (70% of teachers agreed with all statements). However, it was controversially assessed by university and VET teachers a responsibility of a teacher to share all their created educational resources – although generally half of the teachers agreed and the other half was not sure or disagreed, making separate analysis of university and VET teacher responses it was found that more of university teachers disagreed (47%) in sharing all their created resources than agreed (40%), while 60% of VET teachers were tend to agree (and only 13% to disagree) that it was their responsibility to share all created educational resources.

Initial Lithuanian teacher survey revealed that many teachers (37%) were not sure of what impact OER creation had upon their recognition at global level, however the other (60%) tended to think positively. Research also showed that 33% of the teachers were not aware of what were their feelings, if someone used their OER, leading to the assumption that they had not shared OER previously. The 33% of teachers were also not sure, if creation of OER is driven by student academic requirements, and generally 43% tended to agree and 23% to disagree. However, when analysing VET and university teacher opinions separately, it was noted that 40% of university teachers disagreed (40% were undecided), while 67% of VET teachers agreed (27% were undecided) that they adopted OER as this fulfilled academic requirements of their students. Some of the summarized insights and other ideas, revealing teacher attitude and skills towards OER are presented in Figure 1.

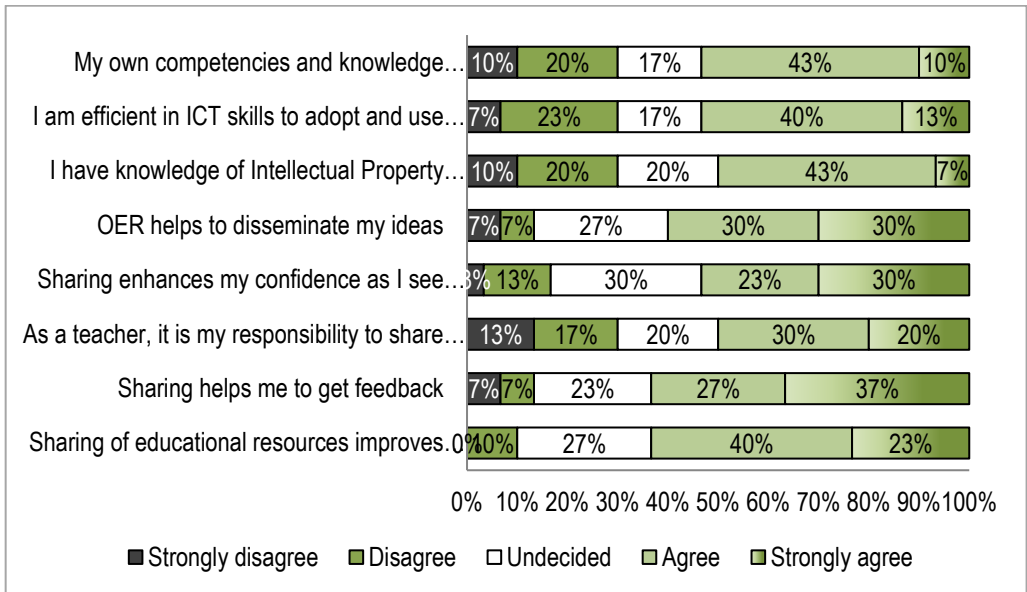


Figure 1. Attitude to OER creation and use by university teachers

To sum up, according to Lithuanian university and VET teacher survey most teachers had a positive attitude towards OER creation and sharing: it was a pleasure for them if someone adopted or adapted their educational resources; sharing enhanced their personal and organizational reputation; and they agreed that their sharing of OERs would encourage others to share. However, only half of the teachers agreed that they as teachers have to share their personally created educational resources and assessed their ICT skills to adopt and use OER as sufficient. Even less of the teachers indicated that they have knowledge about intellectual property rights and licensing of their OERs.

Conclusions

1. University teachers are not sure if they have the skills for OER development. The comparison of VET and university teacher skills showed that VET teachers tend to rate their skills higher than university teachers.
2. University and VET teachers don't feel the need to share all created resources – only half of them feel that it is responsibility of a teacher to share all resources created by them. However, most of the teachers agree that OERs contribute to idea sharing and person's professional respect, as well as to receive feedback.

3. The research results confirm that teachers need trainings, guidance on the use of specific tools, and institutional encouragement to start creating and using OER for teaching.

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The Design of a Rubric for Defining and Assessing Digital Education Skills of Higher Education Students

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Abstract

The usage of rubrics is developing in Higher Education in particular in the field of digital skills. First reason, rubrics are supporting the learning of complex skills, in particular for formative assessment. Rubrics are then finding a natural place in HE institutions where digital education skills become more and more important and need to be well defined and assessed. Second reason, the rubrics' very easy principles may contribute to this development.

However, besides such basic principles, additional rules seem necessary to turn a rubric into an efficient assessment tool. We explain in this article the rules that we have applied during the design work of a rubric about the students' digital skills. Some rules come from the literature and other ones elaborated by our team. With this analysis, we want to bring concrete guiding elements for the design of rubrics. A general rule seems to emerge: a rubric maker should always try to distinguish between all the descriptive elements of a competence, needed to perform a task, and all the different levels of mastering that can be seen for this competence in a person who is performing the task.

Abstract in French

L'utilisation des grilles critériées se développe dans l'enseignement supérieur en particulier dans le domaine des compétences numériques. Première raison, ces grilles aident l'apprentissage de compétences complexes, en particulier pour une évaluation formative. Elles trouvent alors naturellement une place dans les institutions d'enseignement supérieur où les compétences numériques deviennent de plus en plus importantes et ont donc besoin d'être bien définies et évaluées. Deuxième raison, la simplicité des principes de ces grilles contribue au développement évoqué.

Toutefois, outre ces principes simples, des règles supplémentaires semblent nécessaires pour transformer une grille critériée en un outil

d'évaluation efficace. Nous expliquons dans cet article les règles que nous avons appliquées lors de la conception d'une grille traitant des compétences numériques des étudiants. Certaines règles ont été trouvées dans la littérature et d'autres élaborées par notre équipe. Cette analyse apporte des éléments de guidage concrets pour la conception des grilles critériées. Une règle générale semble émerger : un concepteur de grille devrait toujours séparer les éléments descriptifs d'une compétence, nécessaire à l'exécution d'une tâche, et les différents niveaux de maîtrise de cette compétence, observables chez une personne qui exécute cette tâche.

Keywords: Higher education, Student, Digital skills, Rubric, Assessment, Design rules

Introduction

When joining a university cursus, students usually have a previous experience with a few computer tools such as Word, PowerPoint and entertainment social media. But they have to further develop their digital skills in order to learn their student job. The 21st century context makes digital education always and everywhere present in Higher Education. Then the Personal Learning Environment (PLE) of students is changing radically over the first semesters of their life at University. The pedagogical and technological aspects of their PLE change because of all digital skills that students have to develop for their learning tasks and for a good use of computer tools that can help to perform these tasks.

Concretely, students need to learn how various learning tasks, linked to their course activities, must be performed in the academic world (research of thematic information, academic document writing and team collaborative working, etc.). For example, in order to do a good thematic research of information, they have to learn and use concepts like "information validity". Students also need to learn how to complete their computer and network know-how by developing usages of new features and new tools, usually unknown from young students. For example, they have to learn how to manage in Learning Management Systems, in scientific online databases and with bibliographical managers.

To help the students to learn about these multiple facets of digital education, we developed a competence framework that is structured on the description of the student learning tasks, with their usual steps and finalities, and on the proposition of the computer tools that can help students performing these tasks. The delivery of these description of tasks and propositions of tools, taking the form of an online guide (myple.ch), was the first achievement of a student support project at the University of

Fribourg. A second achievement was the creation of a competence framework, written as a series of rubrics. With these rubrics, we want to propose, for all the tasks documented in myple.ch, a detailed competence description and a formative assessment tool (Platteaux, Sieber, & Lambert, 2017). With these resources, we aim to help guidance of individual students for developing their digital competences and for identifying their individual strengths and weaknesses.

This first version of our rubric led our team to the identification of a few defaults that can be overpassed when writing the rubric in order to make it an efficient assessment tool. The aim of this article is to present the analysis of these defaults and the solutions that were found to counterbalance them. Through this analysis, our article wants to be very pragmatic, to show principles and examples about rubrics taken from the scientific literature, and from our own work, and to bring guidelines that could bridge theoretical principles and concrete work results for the doing of a rubric. We are placing thus our work in the perspective of a recent claim:

“One of the major causes for problems in rubric design is that there is very little research on how to formulate clear, meaningful, unidimensional and differentiating dimensions that are used to describe skills' mastery levels” (Rusman & Dirkx, 2017; p.4).

Analysis of rubrics' design, between a free simple shape and constraining rules

Recent works showed that the term rubric is used with many meanings (Dawson, 2015). Then, to introduce our analysis with a clear notion, we refer to the following two simple definitions of rubrics:

Global definition:

“A rubric has three essential features: evaluative criteria, quality definitions and a scoring strategy” (Popham, 1997; p.72);

Operational definition:

“A rubric is a matrix containing the various factors of an assignment along one dimension (rows) and descriptors of the qualitative levels of accomplishment along the other dimension (columns)” (Anderson & Mohrweis, 2008; p.85).

With such definitions, one can understand that the free basic shape of rubrics is advantageous for the description and the assessment of skills that are needed to perform a task:

- Natural basic structure: the two dimensions of the rubric structure favours a natural construction where lines show the aspects of a task (the evaluative criteria) and columns show the levels of accomplishment (the quality definitions);
- Convenient for substructures: different substructures can be easily built up and presented, by separating or regrouping series of lines and/or columns;
- As many lines as wished: the different activities of the described task, and/or their associated skills, can be explained with the desired number of details;
- As many columns as wished: the number of accomplishment levels can be chosen freely, ie. the desired precision of the assessment scale.

This freedom of design and this simplicity of rubric attract many educators who are looking for assessment tools. In particular rubrics are more and more present in educational institutions, in the context of the 21st century skills' development, because "rubrics are used as an instrument to support learning complex skills in schools" (Rusman & Dirkx, 2017; p.1). More precisely, authors like Lowe and her colleagues, working about the Information Literacy skills, assert the power of rubrics because they allow for objective, *authentic* assessment of student work: "Rubrics make clear to students the expectations of their instructors and provide consistent and transparent performance criteria" (Lowe, Booth, Stone, & Tagge, 2015; p.492). Other authors emphasize the need for more research to better understand how much the formative use of rubrics impacts learning (Greenberg, 2015).

Then the problematic of the rubric use is in the educational world: how can rubrics help the learning of complex competences and its assessment? With this perspective, the main aspect to be understood in the rubric design is perhaps not its matrix shape: "It may turn out that it is not rubrics per se (that is, rubrics as an assessment tool in a particular form), but the provision of focused learning goals, criteria, and performance descriptions in whatever form that supports learning and motivational outcomes for students" (Brookhart & Chen, 2015; p.364). With this in mind, we want here to review, in the literature and in our experience, the rules that can be listed for the writing of rubrics' evaluative criteria and for the definition of rubrics' quality scales.

Here below are the rules that we have found about the skills' evaluative criteria:

- Popham underlines how the task description writing is central: “the rubric’s most important component is the set of evaluative criteria to be used when judging students’ performances” (1997; p.73).
- For the writing of skills, it is very helpful to use, as a basis, the description of the associated task and, in addition, to establish a clear hierarchical cascading structure of the task, of its activities and of their actions (with the corresponding competence, skills and sub-skills). This structure simplifies much the work of design (our experience).
- The wording of skills is very important: “a balance between generalized wording, which increases usability, and detailed descriptions, which ensure greater reliability, must be achieved” (Rusman & Dirkx, 2017; p.3).
- “The purpose of internal validity evidence is to demonstrate the relationships among the criteria within a rubric.” (Brookhart & Chen, 2015; p.355).

Here below are the rules that we have found about the skills' evaluation scales:

- The scoring strategy can be holistic or analytic (Popham, 1997; p.72):
 - “Using a holistic strategy, the scorer takes all of the evaluative criteria into consideration but aggregates them to make a single, overall quality judgment.”
 - “An analytic strategy requires the scorer to render criterion-by-criterion scores that may or may not ultimately be aggregated into an overall score.”
- “Rubrics can contain detailed grading logic, with numbers and even formulae; alternatively they can have no numbers, and be suggestive of broad quality levels” (Dawson, 2015; p.3).
 - “For the scale to be generic enough to be applied in a variety of university courses, the descriptors need to refer to a spread of performances at each level. On the other hand, there is a risk that these statements may be too general and thus lead to inconsistent interpretation of the data” (Simon & Forgette-Giroux, 2001; p.105).
- “The levels in a rubric should be parallel in content, which means that if an indicator of quality is discussed in one level, it is discussed in all levels” (Rusman & Dirkx, 2017; p.3).

- “The consistency between the dimensions used within the performance indicator descriptions within and across rubrics was quite poor. Most rubrics used words signalling a mastery level only in one or two performance indicators per constituent sub-skills. Also across rubrics, many different verbal qualifiers or signalling words were used to describe the same scales” (Rusman & Dirkx, 2017; p.7).
- The number of levels in evaluation scales, who is right?
 - If the rubrics have few levels, there is a decrease of the assessment quality because: “People usually avoid extreme positions so a scale with only a few steps may, in actual use, shrink to one or two points” (Bandura, 2006; p.311);
 - A few assessment levels and a good differentiation between the levels maintain the assessment reliability (Berthiaume & Rege Colet, 2013).
- Rules and existing data can help much the choice of the adequate verbal qualifiers for the definition of a good evaluation scale (Rohrmann, 2007).

Application to the creation of a rubric for digital education skills of higher education students

At the beginning of the work presented in this article, we had a first version of a competence framework written as a rubric designed as a table and for a use that Dawson calls “Quality definition”, where each cell defines “a particular evaluative criterion at a particular quality level” (2015; p.8). Also, in this case the evaluation strategy is holistic, according to Popham (1997). Figure 1 shows how our rubric was structured. One can see that the quality level was based on a three level scale. The competences needed to perform a complete learning task (for example: Writing an academic paper) was described by a series of tables, each table dedicated to a competence needed to perform an activity of the task (for example: Structuring a written document with a table of contents). Finally every single line of a table was focused on a skill that can be mobilized to perform an activity (for example: Making an automatic table of contents in Word).

Activities	Actions	Level 1 "discover"	Level 2 "try and choose"	Level 3 "deepen"
Competence 1 for Activity 1	Indicator 1.1 for Action 1 of Activity 1	Description of every action at every level of competence C1 written with 2 types of evaluation criteria: <ul style="list-style-type: none"> • management of information • use of device 		
	Indicator 1.2 for Action 2 of Activity 1			
	Indicator 1.3 for Action 3 of Activity 1			

Figure 1. Original rubric structure of our competence framework (Platteaux et al., 2017; p.3065)

In this first version, we identified three main defaults in the rubric cells: (a) not systematic description of the skills, (b) mixing of information elements that are descriptive and evaluative; (c) the three levels' scale does not allow the efficient assessment of the skills associated to the cells.

The article considers in the following lines how we improved the first version of our rubric. Doing this, we would also to link design principles of rubrics with concrete examples of rubrics illustrating how principles can be applied.

Let us see first how we improved the systematic description of the skills. Our main problem in the version 1 was a lack of consistency in the description of the different skills of each activity. More precisely, we noticed that it was very difficult to write different accomplishment levels of the same skill. Very concretely, there are two problems: (a) it is difficult to write the absence of a skill (for the low level cells) and (b) it is difficult to initiate and maintain consistency of the evaluation levels when the described skills have different sub-skills that are logically linked to different evaluation scales.

Then we decided to rewrite every skill of an activity in three steps: (a) regrouping all the description elements of the skill, (the elements that were dispersed in the version 1 through the different level cells); (b) listing of all the sub-skills of the skill (two types: knowledge and know-how) and (c) writing of the "upper level" of the skill.

We insist here on how much the second step helped us to progress towards a complete and clear description of all needed skills. Indeed, educators are used to think with actions of learners, linked to knowledge and/or know-how. Knowledge and know-how are then good helps for finding all the sub-skills of a skill. Furthermore, for a competence framework about digital skills, it is also very helpful to think about

knowledge and know-how that are linked either to the computer tools, and their features, and either to the learning task itself.

We do advice also any rubric designer on the importance of the step 3, it means to target the achievement of an “upper level” skill description. With “upper level”, we mean that the rubric designer should first assemble all the skills that are mobilized by a student who is perfectly performing the activity. If you have such a result in front of your eyes, you can think about evaluation scales and skill levels. On the contrary, if you try to write down all the different levels of achievement of a skill that is not well defined, you are in trouble (methodological trap).

We see this trap like the cause of the second main default of our rubric version 1. It consists mainly in the mixing of two types of information: (a) description elements of the skills needed to perform a task activity and (b) definition elements of the assessment scale(s) for these skills. For our competence framework, our experience revealed that a clear way to distinguish the two types of information is to think to them as follows:

- If information refers to the task, for example a particular tool that can be used to perform this activity, this informative element is a description element of the task. It is then turned into a skill for a competence framework like in the following example:
 - The student can use the computer text treatment tools;
- If information refers to the way an individual person is able to perform a particular step of the task or to use a tool that can help to perform this step, this informative element must be taken into account in order to set the evaluation scales and the skill accomplishment levels. Usually such information is qualitative or quantitative, such as in the following examples:
 - The student can use four computer text treatment tools;
 - The student can use very well the computer text treatment tools;
 - The student can use all the principal features of the computer text treatment tools.

Concerning the third default of our rubric version 1, the solution that we have built can be said shortly: we turned to an analytic scoring strategy. Indeed our analysis of the third default was enhancing different points:

- Many students using our rubrics were never choosing the lowest level, in any skill. By having 3 levels only, our assessment tool precision was decreasing much.
- Many times, students were telling us: “I feel to be between two levels” or, more precisely, “For this aspect of the skill, I feel to be at level 2. But, for this other aspect, at level 3.” We then thought that different evaluation scales for different evaluation criteria was a better scoring strategy.
- We analysed the time spent by students to answer all the questions of a rubric. This was significantly less than what was necessary to read the descriptions of the skill levels. It was obvious that our students were not reading all the descriptions, but perhaps just the title of the activity competence, before to evaluate themselves. Then we were doubtful about the evaluation quality obtained with such a rubric.

On this basis, concerning the scaling strategy, different transformations were operated on our rubric version 1. Many of them were inspired by the idea of dimension as expressed by Rusman and Dirx (2017) who emphasize that three performance indicators are commonly used: amount, frequency and intensity.

Let us also underline that, at this stage of the rubric design, there can be a few roundtrips between the writing of the skills and the set-up of the evaluation scales. The roundtrips done must increase the coherence and the operational aspect of the skills and of the evaluation scales. Then this stage of design has implications and/or depends on a specific skill but also on the whole rubric. The choices to make are different if the scaling strategy of the rubric is supporting a more qualitative, or quantitative, evaluation approach. The example below, extracted from our work where we have chosen mainly a writing 2 type, will clarify what we are discussing now:

- Writing 1 of a know-how skill: To know how to use various selection criteria in order to decide if a document, found with a request in a bibliographical database, meets the needs of an information retrieval task;
 - Evaluation scale 1: The rubric can propose the student to evaluate what type of action he is usually doing during this activity, for example by using the revised Bloom’s taxonomy (Krathwohl, 2002): to apply, to analyse, to evaluate, to create. We have then set a qualitative evaluation for this criterion.
- Writing 2 of a know-how skill (more operational): To know how to analyse a document, found with a request in a bibliographical database, according to various selection criteria in order to decide if the document meets the needs of an information retrieval task;

- Evaluation scale 1: The rubric can propose the student to evaluate how much help he needs to perform the analysis described in the skill or how often he is performing such an analysis when adopting or rejecting a document. We have then set a quantitative evaluation for this criterion.

After this phase, aiming at choosing the exact skill for an evaluation criterion and at defining the associated type of scale, we used the considerations that are validated for defining “verbal qualifiers” (Rohrman, 2007, p. 11):

“(1) appropriate position on the dimension to be measured; (2) low ambiguity (i.e., low standard deviation in the scaling results); (3) linguistic compatibility with the other VSPLs chosen for designing a scale; (4) sufficient familiarity of the expression; (5) reasonable likelihood of utilization when used in substantive research.”

Then, by using the quantitative analysis done by the same author, we obtained for our scales:

- Intensity qualifiers for a 6-point scale: not at all, a little, partly, quite, very, extremely;
- Frequency qualifiers for a 6-point scale: never, rarely, sometimes, fairly often, very often, and always.

Conclusions and perspectives

We focused this article about concrete facets of the rubrics’ design. To summarize our experience, we can recommend a design of such assessment tools that follows the steps presented in the Table 1.

As a conclusion, it seems to be that rubrics were mostly used with their basic matrix shape where a single skill evaluation scale is used and based only on a few accomplishment levels. The simplicity of a few rubric principles perhaps damaged the educational potential of rubrics, deeply related to assessment. However, it is possible to take advantage of different rules to make the rubrics less simple but more efficient. We have found a few of them but we were surprised about the fact that the literature about rubrics seems to be poor in the rules about skill description. More information can be found about the scaling strategy. This is an axis for future research about rubrics because the skill description and the scaling strategy are deeply linked, as we showed in this article. Other authors concluded: “a literature that is beyond its infancy but not yet mature.” (Brookhart & Chen, 2015; p.362).

Table 1: Steps for the design of a rubric

Design steps	Work to be done	Expected results
Task writing	To write down the task, with its different usual chronological activities (steps) and for each of them: their finalities, main learning concepts and main computer and methodological tools to be used when performing the activity, tricks and traps.	A comprehensive overall view of the whole task. A comprehensive view of the diverse activities composing the whole task. A good understanding of the resources needed to perform the task (concepts, tools, etc.).
Skill listing	To define the main competence associated to each activity and to create the list of the skills that are “the constituents” of the competence. To do a listing, for each skill, of its sub-skills by using the two types: knowledge and know-how.	All the aspects of the task transformed in a list of skills and sub-skills that are mobilized when somebody performs the task. All the information elements that make it possible to set the evaluation scales and the skill levels.
Scaling strategy	To choose between a more or less qualitative or quantitative scaling strategy and more or less operational skills.	All the evaluation information transformed in the various necessary evaluation scales and skill levels.

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Digital Technologies: Identification of Patterns and Teachers' Profiles in the Catalan Context

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Abstract

The purpose of this article is to understand the perspectives of Catalan teachers regarding the role of digital technologies in Education. The analysis relied on questionnaire survey data, using multivariate statistical analysis (principal component analysis or PCA) in order to understand patterns in teacher perspectives about digital technologies. This was followed by employing a clustering technique to identify teacher profiles of perspectives on the relationship between digital technologies, teaching and learning based on those patterns (using principal component scores). During a later stage, those profiles were characterized by relating them with teacher characteristics, digital competence levels, and usage of digital technologies in teaching practices. Our findings suggest that there are 5 main patterns that structure teachers' perspectives on this relationship: usefulness for networked learning, usefulness for effective learning, usefulness in the learning process, threats for learning and importance of combining new technologies with traditional methods. In addition, six teacher profiles were identified based on the teachers' positioning regarding these five perspective patterns.

Keywords: Digital Technologies, Teachers, Digital Competence, Teachers' perspective, training methods, Teachers' Patterns

Introduction

The recent developments in Information and Communication Technologies (ITCs) are transforming how we live, work, produce knowledge and learn. This transformation is visible in the educational field as well, since there has been a profound process of implementation of ICTs in educational institutions as reported by authors such as Area et al. (2014) or Paredes et al. (2015). In the case of Catalonia, the education department of the government has supported the integration of ICT in education, considering it in the in the Education Law of Catalonia (LEC), in which ICTs are addressed explicitly and, according to the Article 52, "to train students for

the critical analysis of the media and the use of new technologies” is a main objective. In addition, it states that curricula “should be oriented towards the acquisition of basic skills, which should contribute to the personal development of students and to the practice of active citizenship, and must incorporate information and communication technologies in the learning processes”. Thus, a critical perspective on ICTs usage and its connection to citizenship is already included in the LEC of 2009.

The education department defined the students’ digital competence back in 2013 and how it should be integrated in the educational curricula. Considering the previously cited law, this emphasis on student digital competence must not be isolated from a change in the role of teachers, which the law also mentions. In article 104 on teaching function it is indicated that “the teachers and professors have, among others, the functions of ... using information and communication technologies, which they must know and master as a methodological tool”. Also, with respect to teacher training in the text, it is specified that “initial teacher training should include ... mastery of information and communication technologies”. In the legal text’s framing of ICTs in teaching, technologies themselves are not considered the primary vector of intervention but become subordinated to the roles of the teacher and pedagogical methodology.

It is known that teachers’ perceptions greatly impact their teaching practices (Domingo & Garganté, 2016). There have been qualitative studies on teacher views of ICTs (Alonso, Guitert & Romeu, 2014; Area et al., 2014). This paper deals with the same phenomena in a quantitative approach, while trying to be faithful to the original complexity and heterogeneity of teacher perspectives on the relation between digital technologies, teaching and learning. The method employed was an international online questionnaire survey, undertaken in the frame of the DECODE, (DEvelop COmpetences in Digital Era) research project. This article focuses on the questionnaire and the data from Catalonia.

Method

The design of the research is based on a quantitative perspective (Cohen, Manion, & Marrison, 2007) with the use of an online survey as a data gathering tool that was designed following the current bibliography on the field.

The survey was sent to the directorate of non-higher education Catalan schools (kindergarten, primary, secondary and vocational training), who were asked to share it among each schools’ teaching staff (total sample size of 425 after filtering out

incomplete cases). Two questions containing sets of Likert-scaled items were used to measure teachers' perceptions about technology. The first set of items is related to the usefulness of technologies in learning and teaching. Respondents were asked to rate them according to a 5-point scale ranging from *Not at all* to *Very useful*. The second set of items consisted on phrases related to the impact of technology in learning and teaching. These items were rated according to a 4-point scale ranging from *Totally disagree* to *Totally agree*. The Likert-scaled items were then treated as quantitative (interval) variables. In order to make sense of the variables related to the personal views of teachers regarding educational technologies, we performed a dimension reduction technique called principal component analysis (PCA). It allows the identification of principal components, which are a linear combination of variables that reduce complexity and help the analytical process. The PCA statistical technique (Jolliffe, 2011) uses an orthogonal transformation to convert observations of possibly correlated variables into values of linearly uncorrelated (not directly observed) variables called principal components. This transformation is defined such that the first principal component has the largest possible variance (i.e., accounts for as much of the variability in the data as possible), and each succeeding component has the highest variance possible – under the constraint that it is orthogonal to the preceding components. The result is a new orthogonal coordinate system that optimally describes variance in a dataset: reducing a large set of variables to a smaller set while containing most of the original information.

The resulting components were then used for creating teacher profiles, using a clustering (segmentation) technique, on the basis of their perspectives on the relationship between technology teaching and learning. The cluster analysis was carried out using the standardized principal component scores resulting from the abovementioned PCA and the k-means partition method (Aldenderfer & Blashfield, 1984; Hartigan, 1975). The *optimal* number of clusters was identified using the traditional approach of calculating the cluster solution for the various numbers of clusters and plotting the within-cluster error for each. The resulting *scree plot* should show an *elbow* – point in which the relative change in error stops diminishing substantially as the number of clusters in the solution increases – at the correct number of clusters s (Gierl & Schwanenberg, 1998; Gower, 1975). Finally, these profiles were characterized in relation to professional and socio-demographic variables, digital competence, internet usage patterns, and the adoption of digital tools in their teaching practices. The questionnaire contained the digital competence Likert-scaled indicators from the European Framework for the Digital Competence of

Educators: DigCompEdu (Redecker, 2017), which were treated quantitatively and averaged to create a single digital competence index.

Results

Principal Component Analysis (PCA)

The PCA used 21 items (the previously mentioned employability skills) and was performed in R (version 3.4.0) using the Principal components analysis (*principal*) function of the Procedures for Psychological, Psychometric, and Personality Research (*psych*) package (version 1.8.4). The overall Kaiser-Meyer-Olkin (KMO) measure of sample adequacy (MSA) is 0.91 and the same measure for each variable has a minimum value of 0.73 which means the sample is adequate for performing a PCA (minimum acceptability threshold is 0.6). The PCA resulted in 4 principal components with an Eigenvalue bigger than one, the rule of thumb for identifying the number of components, but we decided to retain a fourth (its Eigenvalue was 0.88, thus close to one). Finally, the PCA used the varimax orthogonal rotation method. The high values of variable loadings (variable loadings in each principal component translate the covariance/correlation between the original variables and the components) allow the characterization of the different components. The naming of each component resulted from the interpretation of the associated variables (presented in the order of the highest loadings):

The first component was mainly associated with the following variables:

- improve communication, collaboration and coordination between colleagues, students and institutions;
- strengthen continued professional development (CPD) as a teacher;
- involve other actors in the learning process;
- link school activities with work experience practices;
- integrate formal, non-formal and informal learning.

Since it seemed to point to the usefulness of ICTs for making connections in the pedagogic process, both within the classroom and with the exterior environment, we named it *networked learning*.

The second component was mainly associated with the following variables:

- to make students more autonomous;
- to make students more active in their own education;
- to make the learning process more meaningful for students;
- to make the learning process more effective (students who have achieved superior results than expected);
- to make the learning process more efficient (success with less effort and / or lower costs).

This component also seems to be related to the pedagogic process, but mostly refers to the effects of technology in terms of autonomy and content knowledge meaningfulness and acquisition. Thus, we named it *Active learning*

The third component was mainly associated with the following variables:

- the use of digital technologies promotes the development of responsible digital and media skills;
- the use of digital technology promotes positive learning outcomes by influencing how students behave;
- the use of digital technology promotes the development of basic skills (reading, writing, understanding);
- the use of digital technologies helps when designing and organizing educational materials.

The third component, like those before, is also associated with the pedagogical possibilities of technology: the acquisition of basic digital, media, reading and writing skills, positive impact in student behavior, in addition to material design and organization as well as student self-evaluation. Therefore, we chose the name *Effective learning* in order to denote the more operational aspects of these items.

The fourth component was mainly associated with the following variables:

- the use of digital technologies is a distraction for students;
- the use of digital technologies increases the level of cyberbullying;
- digital technologies do not improve the processes of teaching and learning.

This component is clearly related to a negative view of technology, so we termed it *Threats of technology for learning*.

The fifth and last component was mainly associated with the following variables:

- it is necessary to integrate e-learning into teaching activities, along with traditional classroom-based teaching methods;
- the use of digital technologies does not have to replace traditional methods of teaching;
- the daily use of technology in the classroom is not enough, students need to learn how to use books.

The component is most associated with variables that relate to the irreplaceability of traditional teaching methods by technology, which led us to name it *Complementary with traditional methods*.

Cluster analysis

The following section refers to the comparative characterization of teacher profiles found through cluster analysis (see Table 1):

Table 1: Teacher profiles and averages of the principal component scores used as inputs in the cluster analysis

Cluster	N	%	Usefulness for networked learning	Usefulness for effective learning	Usefulness in the learning process	Threats for learning	Useful only when combined with traditional methods
1	120	28	0.20	0.58	-0.65	0.15	-0.57
2	96	23	0.19	0.09	0.06	-0.80	1.07
3	81	19	0.63	-0.41	0.80	-0.34	-0.70
4	55	13	-1.83	-0.03	0.20	0.16	-0.11
5	40	9	-0.06	-1.67	-1.02	0.61	0.15
6	33	8	0.30	0.71	1.12	1.61	0.65
Total	425	100	0	0	0	0	0

Profile 1

Teachers in the most common profile, containing 28% of the total sample, consider technology useful for effective learning but not useful in the teaching-learning process and tend to neglect the importance of combining it with traditional teaching methods. The digital competence of these teachers does not differ from the overall sample. This seems to suggest an idealized but not applicable perspective on the relationship between technology, teaching and learning. In terms of socio-demographic and professional characterization, teachers in this profile seem to follow the overall sample distribution except for gender, containing a higher percentage of women. Personal digital technologies usage also tends to follow the overall sample distribution except

that these teachers tend not to use said technologies for leisure. Finally, their usage of digital tools for teaching practices is also typical, except for a higher usage of tools for audio/video/graphic edition.

Profile 2

The second most common profile contains 23% of the sample and is the profile that mostly considers the importance of combining digital technologies with traditional methods while, at the same time, the one which least associates it with learning barriers. This profile's perspectives on digital technologies' usefulness for learning (networked learning, effective learning and learning process) are close to the overall sample mean and it shows higher values of digital competence. Thus, it denotes a balanced position that stresses the importance of traditional methods. It does not differ greatly in terms of professional and socio-demographic characteristics from the whole sample, except that it tends to contain more school digital coordinators. Personal digital technologies usage is similar to the first profile except that these teachers tend to use them for leisure. Comparatively, a greater diversity of tools are also more frequently used in their teaching practices: tools for audio/video/graphic edition, office and similar programs, learning/communication/collaboration environments, and relevant multimedia programs.

Profile 3

In third place, containing 19% of the sample, comes the profile that most neglects the importance of combining digital technologies with traditional methods. It tends to emphasise formal usefulness (aiding in networking and in the learning process) of digital technology for learning but not its pedagogical effectiveness. The digital competence level of this profile tends to be close to that of the overall sample. These teachers tend to be older and teach in lower level schools. Personal digital technology usage is associated with professional networks and personal/professional development. Digital tools usage in teaching follows the overall sample distribution but the profile shows a greater tendency for using digital forms of self- and co-assessment, and also using digital rubrics for assessment.

Profile 4

The fourth profile contains 13% of the sample and is characterized by average values (close to 0) in all component scores except for usefulness in networked learning. This profile is thus characterized by a sceptical view about technology's ability to connect learning to other spheres of activity. The digital competence level of this profile is

comparatively lower. The profile contains less women and less school digital coordinators. These teachers tend to be younger and teach in higher level schools (secondary overrepresented). In terms of digital technology usage in learning, they tend (somewhat expectedly) not to create blogs and websites nor to use learning/communication/collaboration environments. They are also characterized for not using coding/computational thinking in teaching nor digital portfolios for assessment.

Profile 5

The fifth profile, containing 9% of the sample, is characterized by the lowest scores in the usefulness for effective learning and in the teaching-learning process, accompanied by a significantly higher identification of technology with threats to learning. The level of digital competence in this group is lower than the overall sample. These teachers tend to be older, contain less women, teach in higher level schools (VET highly overrepresented), and contain less school digital coordinators. They exhibit the tendency not to use digital technologies: for personal usage / as tools for teaching or assessment.

Profile 6

Finally, the sixth profile, which contains 8% of the sample, shows both the highest values in terms of considering digital technologies useful for effective learning and the learning process, as well as the highest values concerning the threats they may pose to learning. In addition, it also tends to highlight the importance of combining these technologies with traditional methods. These teachers tend to be older, contain more women, teach in higher level schools (secondary schools are overrepresented), and contain less school digital coordinators. This group exhibits the highest level of digital competence of all the identified profiles and a higher tendency to engage in all personal uses of digital technologies (social networks, professional networks, personal/professional development, and leisure). Finally, these teachers tend to use all sorts of tools more frequently than their counterparts except for resources for creating blogs and websites, and a high proportion of them uses all the digital assessment tools mentioned in the survey.

Conclusions

The performed PCA suggests that there are five main big patterns that organize Catalan teachers' perceptions on the relationship between digital technologies and education. The first three are related to the pedagogic usefulness of technologies: one related to the possibilities of a more open and socially inclusive education model (networked learning), another to the successful acquisition of knowledge and skills (effective learning), and the last is associated with improvements in pedagogical situations (learning process). There are, however, other patterns in teacher perspectives that do not associate digital technology with usefulness but with dangers (threats for learning) and with the older, traditional teaching and learning methods (importance of combining digital technologies with traditional methods).

In order to better understand the heterogeneous reality of these perspectives, it is not enough to identify agglomerating patterns in terms of perspectives on technology and education. It is important to describe how the teachers position themselves in relation to these axes. This is the rationale behind the creation of the teacher profiles. The recent development of computing and other digital technologies has been rapidly changing the daily lives of an increasing amount of the world's population. In the field of educational technology, like in many other fields of scholarship that deal with the impact of emerging technologies, there is a *default logic* which associates computing with a general tendency towards improvement (Bigum, Bulfin, & Johnson, 2015). This *default logic* is not limited to research about education and technology but also to the perception of most Catalan teachers: the most common profile (profile 1) seems to have a positive view on technology but not on the possibility of implementing it into their teaching practices (learning process).

The second most common profile, however, is related to the importance of integrating and combining new technologies with traditional methods, referring to a more balanced and nuanced perspective on this relationship. The third profile sees the formal benefits of technology but not its pedagogical effectiveness. The fourth tends to be sceptical of the networking and connecting possibilities of digital technologies in education. The fifth profile comprises those who tend to be critical of digital technology's usefulness for teaching and learning. Finally, the sixth and smallest profile comprises the teachers who are advanced users of digital technologies. The identification of those teachers is useful in the sense that they can be ascribed an orienting role in training programmes to foster their colleagues methodological digital

competence and critical awareness of both the possibilities and the dangers that technologies pose to learning.

The profiles identified can be useful in the detection of teachers' training needs for the design of training proposals in digital competences. Further research can be focused on the relationship between the identified profiles with teachers' level of digital competence in order to design training proposals adapted to each of these profiles.

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