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Editorial – Volume 20, Issue 3

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Welcome to the third issue of 2019. I hope you are having a good summer. For many, this is not only a time of new ideas and sharing at conferences, but also a chance to step back a moment from the regular mayhem to reflect.

Here at *IRRODL* we are also taking some time now for self-examination. You will have noticed that as of May 1, 2019 we took a break from accepting submissions (not more than six months) and will be moving to a regularized publication schedule in 2020. As part of our break we are not only catching up on the long publication queue but are also discussing internal processes to improve our focus, balance of topics, and shorten the time from submission to publication.

In a short span of time *IRRODL* has grown tremendously in popularity, while earning a reputation for high-quality articles. In part, this is because of hard working and dedicated staff supporting the journal. However, I believe our success is primarily due to the ongoing contributions of scholars, and the time and expertise of our reviewers. The value of that community of peer reviewers cannot be overstated. Still, success for *IRRODL* has also meant dealing with about 600 submissions each year. It is a good problem to have, but still requires careful consideration as to how to best deal with this given our limited resources.

In the meantime, for your own reflections and summertime reading we offer an issue which provides some interesting ideas as well as inspiration.

In our first article **Lin** presents us with a study of undergraduate students' perceptions of using only OER in an introductory course at a large American public university. Advantages and challenges are identified and used to inform course design and implementation.

In the following paper **Mittelmeier**, **Rogaten**, **Long**, **Dalu**, **Gunter**, **Prinsloo**, and **Rienties** unpack the early multifaceted adjustments associated with studying in absence of a physical campus in the South African context. Key factors that impact distance learning experiences for students in this regional hub environment are identified and analyzed.

To address low completion rates in MOOCs **Handoko**, **Gronseth**, **McNeil**, **Bonk**, and **Robin** compare the differences in the use of self-regulated learning strategies between learners who finished their course and those who did not. While goal setting had the greatest influence on completion, the role of other subprocesses are also examined.

In their paper, **Montes-Rodríguez**, **Martínez-Rodríguez**, and **Ocaña-Fernández** investigate the prevalence and characteristics of the case study as a methodology for research on MOOCs. A systematic analysis of current scientific literature is presented, eventually building a case for future research using this methodology.

Subramaniam, **Suhaimi**, **Latif**, **Kassim**, and **Fadzil** explore the factors that could influence readiness levels and indicate that self-efficacy was the most significant. This paper depends on an analysis of adult students studying in Malaysian higher education institutions.

To enhance teachers' continuing professional learning opportunities, **Oddone**, **Hughes**, and **Lupton** propose a model of learning based, in part, on interaction with others through a personal learning network (PLN) underpinned by concepts such as connectivism. The model comprises three elements: arenas of learning, teacher as learner, and PLN.

Al-Samarraie conducts a review of the literature to increase current knowledge regarding the use of videoconferencing systems. A classification of the videoconferencing paradigms from the constructivism and cognitivism perspectives is provided, as well as consideration of relevant challenges that emerge when using certain videoconferencing systems in both learning and teaching situations.

While there are current valid models in the research on adoption of learning technologies, they have a moderate impact on the intention to adopt m-learning among Colombian university students. Indeed, **Gómez-Ramirez**, **Valencia-Arias**, and **Duque** show perceived usefulness and attitude actually have a significant influence on students' acceptance of m-learning and propose an extended model to provide a more complete description.

The next paper considers the perennial and very serious problem of dropout rates for learners in distance education. **Brubacher** and **Silinda** show in their study that intrinsic motivation was a significant predictor of persistence, while competence was not.

In this next study, **Kimmons**, **Hunsaker**, **Jones**, and **Stauffer** analyze website home page system and service data for all available K-12 schools' institutional websites (n = 65,899) in the United States. They provide descriptive results of system and service adoption, as well as ascertaining any differences based upon school demographics and service/system type.

Soffer, **Kahan**, and **Nachmias** examine the ways students make use of the flexibility available in online academic courses. They investigate how those patterns might relate to course achievement.

Babori1, **Zaid**, and **Fassi** conducted a review of the literature covering MOOCs in major refereed journals, produced mainly between 2012 and 2018. The synthesis presented here concentrates on these studies and aims to examine the place held by content.

We also have two book reviews in this issue. First, **Chen**, **Chen**, **Fang**, and **Zhou** look at *Best Practices for Flipping the College Classroom* (Waldrop and Bowdon, Eds.) which is "a noteworthy contribution to the field and is likely to inspire early adopters in terms of further exploration and implementation." Second, **Saykili** determines that the work "offers a renewed lens toward understanding the complexity of

higher education today" in his evaluation of *Transactional Distance and Adaptive Learning: Planning for the Future of Higher Education* (by Saba and Shearer).

We conclude the issue with a couple of Notes from the Field. First, given the substantive number of employees in the health care and social services sector who are seeking continuing education as part of their profession **Colley**, **Schouten**, **Chabot**, **Downs**, **Anstey**, **Moulin**, and **Martin** initiated a study sought to identify and characterize online graduate programs in health sciences offered by Canadian universities. Finally, **Baldwin** and **Ching** provide an excellent review of the characteristics and unique features of a newly released course evaluation instrument from the popular learning management system *Canvas*.

Enjoy!

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Teaching and Learning Without a Textbook: Undergraduate Student Perceptions of Open Educational Resources

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Abstract

Given the upsurge of textbook costs, college students increasingly expect universities and instructors to offer alternatives to traditional textbooks. One textbook alternative is using open educational resources (OER). While OER unquestionably save students money, the question remains whether the adoption of OER (instructional materials) is aligned with open pedagogy (methods). This study investigated 46 undergraduate students' perceptions of using only OER in an introductory course in a large American public university. As reported by study participants, advantages of using OER include textbook cost savings, access to dynamic and plentiful OER materials, that OER enabling mobile learning, and that OER foster the development of self-directed skills and copyright guidelines. Challenges reported include lacking a tactile sense with OER, slow Internet connections, unclear instruction and guidance, and insufficient self-regulation skills. Course design and implementation considerations were discussed.

Keywords: OER, open educational resources, open education, open pedagogy

Introduction

Omnipresent computers, the Internet, and associated technological developments have led to exponential growth in the use of Open Educational Resources (OER) in education (Blumenstyk, 2015). College instructors have increasingly incorporated OER into their teaching, either to supplement their curriculum or to replace traditional textbooks with e-textbooks entirely (Forsyth, 2016; Hilton, 2016). With increased development, publicity, and dissemination of OER, a recent "Opening the Textbook" survey of 2,700 instructors by Babson Survey Research Group (2017) revealed that the number of instructors at two-year and four-year institutions using OER in place of textbooks has nearly doubled from 5% in 2015-2016 to 9% in 2016-2017. Moreover, 29% of the surveyed instructors described themselves as "aware" or "very aware" of OER in 2017, compared to 25% in 2016 and 20% in 2015 (Babson Survey Research Group, 2017). While such data is exciting, the survey also noted that awareness of OER is still low, and that many instructors also reported significant barriers (e.g., finding and evaluating the quality of materials) to wider adoption of OER (Babson Survey Research Group, 2017).

Researchers have called for more empirical studies to determine student perceptions and experiences of using OER – either e-Textbooks or OER components, in teaching and learning in hopes of providing evidence about OER's efficacy and quality (Allen & Seaman, 2014; Hilton, 2016) as well as to help instructors develop a new set of skills and attitudes with open pedagogy (Annand & Jensen, 2017; Hegarty, 2015). Past studies usually investigate e-Textbooks or a partial adoption of OER components. The purpose of this study is to investigate using only OER to replace traditional textbooks in an introductory undergraduate course. It aims to discover how students perceive their experiences differently when only OER are adopted in teaching and learning. The study centers on the following research questions:

1. What advantages did students identify when using only OER in an undergraduate introductory course?

2. What challenges did students experience when using only OER in their learning process?

Literature Review

Forces Promoting the OER Movement

UNESCO first defined the term "Open Educational Resources" in 2002 as: "teaching, learning, or research materials that are in the public domain or released with an intellectual property license that allows for free use, adaption, and distribution" (UNESCO, 2002, p. 24). The ultimate goal of developing OER is "to enable the creation of free, universally accessible educational materials, which anyone could use for teaching or learning purposes" (Hilton, 2016, p. 574).

In the past two decades, several forces have greatly pushed the OER movement. The first force is the prices of the textbooks, which have increased by 82% in the last decade, and students spend an estimated $1,200 per year on textbooks (Affordable Learning Georgia, 2016). In the same time period as the aforementioned textbook price increase, a 7% average annual increase in tuition, fees, and housing occurred as well,

furthering student financial stress (Blumenstyk, 2015). A more recent survey of more than 22,000 college students had sobering results, as 53.2% of these students spent more than $300 on textbooks in a semester, and 17.9% spent more than $500 (Florida Virtual Campus Survey, 2016). Additionally, 66.6% of students did not purchase some required textbooks, and 37.6% of students earned a poor grade as a result. This survey indicated that many college students compromised their academic success because of the high cost of instructional materials. Clearly, the economic barrier of textbook costs on top of tuition is an important factor contributing to student academic failure.

In light of the information presented above, several OER initiatives have emerged to help increase student accessibility to learning materials. Firstly, institutional efforts to fund and spearhead the development of several OER emerged in the early 2000s, including the Hewlett Foundations' Strategic Plan to Increase Access to High-Quality Educational Context and UNESCO's Paris OER Declaration. Additionally, Wikipedia was launched in 2001 and has evolved into the biggest OER that exists. The Wikibooks platform curated numerous open textbooks, Web pages, and classroom projects (Lin & Kelsey, 2009). Moreover, non-profit organizations such as Openstax, Khan Academy, and the Saylor Academy emerged as leading providers of OER (Hilton, 2016). Secondly, upon determining that savings benefits of OER may systematically address the textbook problem in Higher Education, the U.S. Department of Education has launched a $4.9 million pilot program to create and expand academic OER materials for Higher Education in 2018 (Department of Education, 2018). Thirdly, there has been increasing proliferation in publishing and copyright, such as Creative Commons (CC) licensing, GLAMs (Gallaries, Libraries, Archieves, and Museums), and even for-profit companies such as YouTube and Flickr. In particular, CC licensing allows authors to decide how they wish to share their work, reserve their rights, or adjust the license to make their work more open, accessible for reuse, repurposing, and remixing (Kelly, 2014). Higher Education has also worked to support OER growth: a 25-member consortium of Higher Education institutions purchased course materials in bulk from textbook publishers and offered the digital format at a low cost to their students on the first day of a course (Unizin, 2018). Massive Open Online Courses (MOOCs) have also been rapidly adopted in Higher Education: The Open Education Consortium, which consists of hundreds of Higher Education institutions and associated organizations worldwide, spearheaded the creation and distribution of many free MOOC courses to attract a broader audience around the world in the early 2010s (edX, 2018; Lin, 2014).

While these positive initiatives foster the creation and dissemination of OER, researchers indicated that OER has not been systematically integrated into the curriculum due to several critical challenges including: the reality that open technology is still an unknown territory to most instructors (Babson Survey Research Group, 2017), the lack of institutional faculty support and development to integrate OER into curriculum (Annand & Jensen, 2017), and a lack of OER quality assessments to help faculty to choose from the multitude of OER options (Hilton, Bliss, & Wiley, 2013). The following section outlines a framework of open pedagogy. This framework serves as an anchor for instructors seeking to integrate OER into their curricular as well as demonstrates the challenges that exist for instructors.

Theoretical Framework of Open Technology

Readily accessible materials do not guarantee successful teaching and learning with OER. A model of open pedagogy by Hegarty (2015) used eight attributes to guide successful OER integration. Therefore, the model

served as a theoretical framework to guide the redesign of the course within which the study at hand was conducted.

1. **Participatory technologies**. OER technologies enable a participatory culture via tools such as blogs, wikis, videoconferencing, audio file sharing, online journaling and publishing, forums, and chats. However, technology itself does not guarantee a participatory culture to occur naturally (Hegarty, 2015). Instructors need to carefully select OER to encourage interaction, facilitate mobility, and support the development of communities of practice (Cochrane, 2014).

2. **People, openness, and trust**. In an open learning environment, students' willingness to learn, participate, and interact is fragile unless an element of trust can be built (Hegarty, 2015). With this, building confidence and connections among students is a logical step. This type of support engages learners to feel conformable, trusted, and valued as they access and interact with resources and each other (Kop, Founier, & Mak, 2011).

3. **Innovation and creativity**. The New Media Consortium (NMC) 2015 Horizon Report indicated that developing innovative models of learning with OER can foster personalized experiences and collaborative engagement. This attribute stresses that students should not be passive receivers of information by using OER and technologies, and that an open environment can promote innovation, creativity, and engagement in which students act as creators and collaborators (Johnson, Adams Becker, Estrada, & Freeman, 2015).

4. **Sharing ideas and resources.** This attribute states that students are exposed to effective practices in an open environment by sharing their knowledge, ideas, and projects and actively asking for assistance among a community of peers (Hegarty, 2015). Instructors need to adequately address students' reasonable questions such as: "What's in it for me?" "Why do I post my work on the Web?" "I don't want to have my work judged, as it might not be good enough" (Hegarty, 2015, p. 89).

5. **Connected community.** This attribute relates to Attribute 1 in that a connected community is not only important to promote collaboration and sharing via participatory technologies, but also critical to encourage students to function as a community member in OER-based courses (Hegarty, 2015). In the OER-based courses, which students may perceive as too open and less directive, it is important not just for instructors to clarify directions but to also help students adopt a more "peer-to-peer learning" attitude (Conole, 2013).

6. **Learner-centered environment.** Encouraging students to fully engage with OER in the learning process empowers then to take the lead, direct their own learning, solve problems, collaborate effectively, and share work meaningfully (Ehlers & Conole, 2010). Moreover, immersing students in OER encourages them to create learner-generated OER content so that they are able to produce creative work (Ehlers & Conole, 2010).

7. **Reflective practice.** A great part of learning comes from reflecting about what we do. According to Conole (2013), learning with OER is not just about generating experiences, but also about making

time to process those experiences, and reflective practice is an integral part of OER course design and teaching. Students must also have opportunities to reflect and receive feedback from their instructors and peers (Conole, 2013).

8. **Peer review.** While open peer review serves as the foundation to perform in a participatory culture, this approach can pose challenges for some students. Fear of criticism, self-doubt about quality of work, difficulty evaluating the quality of OER, and hesitancy to critique peers' work are some of the common concerns identified by students using OER in their projects (Conole, 2014). From this, researchers recommend that instructors teach students how to evaluate OER quality and model OER integration into student projects (Conole, 2013; Richter & Ehlers, 2011).

After a review of the attributes of open pedagogy, the following question naturally arises: how do students perceive their learning with OER replacing traditional textbooks? In other words, when the opportunities are made available, will students take them? The following section reviews emerging literature on student perceptions.

Student Perceptions of OER

Literature on student perceptions and experiences of OER is still in an early phase of development. Several large-scale studies have investigated student responses to courses using OER either as e-Textbooks or OER components. Hilton, Gaudet, Clark, Robinson, and Wiley's (2013) survey of 1,400 students resulted in 910 responses. Within this survey, 83% of students reported that OER supported their work outside of the class, and 78% of the students would recommend OER to their peers (Hilton, Gaudet, Clark, Robinson, & Wiley, 2013). Feldstein et al. (2012) conducted a survey of 1,393 students about OER. Of the 315 students who responded to the survey, about two-thirds of students "strongly agreed" or "agreed" that they preferred the OER content to traditional textbooks (Feldstein et al., 2012). About one third of the students reported problems with the quality and credibility of the OER content (Feldstein et al., 2012). A third large-scale study on student perceptions involved 345 students in a computer science course who created an OER-supported blog project incorporating two major OER components into their classes (Gil, Candelas, Jara, Garcia, & Torres, 2013). Of the 345 students, 150 (43%) indicated that a blog using OER was better than a blog without OER support, however, 15% of the students favored non-OER blogs (Gil et al., 2013). In another survey of 1,830 students, 79% of 126 respondents reported overall satisfaction with OER integration into the curriculum, while 17% were undecided and 4% were dissatisfied with the quality of the OER (Pitt, Ebrahimi, McAndrew, & Coughlan, 2013).

To sum up, the majority of the surveyed students in the abovementioned studies noted that using OER helped them not only with textbook cost savings, but also positively impacted their learning experiences with OER. One challenge that a limited number of students identified was evaluating OER for quality and credibility.

Method

Participants

Fifty-eight students enrolled in an introductory education course in a large American public university. Forty-nine of them majored in elementary and secondary education, eight in health and physical education, and one in French. Fifty-two students (89.6%) were freshmen and sophomores, and six were senior students. There were 35 female students and 23 male students, and all participants were between the ages of 18 to 21.

Context of the Study

The introductory education course traditionally required students to purchase a $60 textbook. The goals of the course were twofold: promoting the effective integration of technology into lesson plans (technologies focus) and the integration of OER into lesson plans (OER focus).

To meet these goals, the course instructor spent more than 250 hours evaluating and contextualizing OER into the course content. Examples of selected OER as instructional materials included tutorials, lesson plans, journal articles, video clips, case studies, documentaries, blogs, WebQuest entries, library databases, online professional discussion forums, and state and national teacher evaluation criteria. Links to OER content were embedded in weekly modules and provided in a learning management system (LMS) – Desire2Learn. Meanwhile, students in the course were not strictly passive consumers of OER, but instead were "active creators" of OER artifacts as well (Johnson et al., 2015). Some examples of assignments that built upon OER included: the creation of five lesson plans with instructional technologies and OER components, the development of an open blog, weekly face-to-face and online discussions supported by OER references, and peer review of projects based on OER content.

The course employed blended instruction. Students met twice a week in class on Mondays and Fridays and had online discussions and assignments on Wednesdays in the LMS. One example of students using OER to interact was about teaching Internet Safety to elementary students. Students in the course met in class and watched a recent video from a local TV station, explaining how a middle school student was killed by a stranger she met online. Before students in the course recovered from the shock, they were asked to use their devices to explore a national Website, which listed details of child sex offenders in their neighborhoods. Infused with shock, anger, and a strong sense of responsibility to teach young kids about Internet Safety, students formed small groups to brainstorm their lesson plans. After the class, the groups developed their lesson plans including at least three OER-supported references. Afterwards, they received feedback from peers and the instructor online before submitting their final papers.

Data Sources

Data were collected through two sources: an anonymous online survey and two focus groups. First, a reflective survey was designed by the instructor and reviewed by a faculty member who is an expert on education and OER. In addition to demographic questions about gender and age, the survey had four open-ended questions. It took 10-15 minutes to complete in the course LMS. The four open-ended questions included in the survey were:

1. Have you taken any course before in which teaching and learning occurred without a traditional textbook?

2. What do you like about only using OER in teaching and learning?

3. Did the OER content in this course help you learn the same as textbooks would have?

4. What challenges did you experience with OER in your learning and assignments?

A pilot study was administered with five randomly chosen students from the class to ensure the clarity of the questions. Of the 58 students enrolled in the course, 46 (79.3%) took the reflective survey, including 30 females and 16 males. All 46 students indicated that this course was their first course in which OER were used to replace traditional textbooks entirely.

The second data source was two focus groups conducted after the reflective survey, each lasting 20-25 minutes. Of the students surveyed, 29 of 46 (63%) also participated in one of the two focus groups. Building on initial responses in the reflective survey, the focus groups asked more specific questions to generate in-depth examples that may not be shared by the reflective survey. As suggested by Van Manen (1990), the advantage of in-depth interviews is that the researcher can discover the meaning of the lived experience directly from the participants' perspectives.

Data Analysis

The course instructor and a faculty member conducted the data analysis. First, after the reflective survey data had been collected, we followed the constant comparison techniques described by Strauss and Corbin (1990). Following Strauss and Corbin's framework, we first employed the free and open-coding technique, which involves "the naming and categorizing of phenomena through close examination of data" (1990, p. 62). This stage involved exploring and examining survey data to identify common themes, patterns, regularities, and irregularities. Recurring words, themes, and patterns emerged. We, therefore, began to regroup themes and patterns that were conceptually congruent.

After data from the focus groups had been collected and transcribed, we used the same open-coding technique to identify common themes. After identifying recurring patterns and themes from both the reflective survey and focus groups, the researchers began to triangulate data using axial coding. This method makes connections within and between groupings and allows for new combinations of data (Strauss & Corbin, 1990). Where necessary, patterns and themes were regrouped in accordance with the axial coding method as they emerged. Eventually, we categorized the data based on a collection of aggregated instances. In cases of disagreement, we discussed and resolved differences and reached inter-rater agreement at 90%.

Results

Research Question 1

What advantages did students identify when using only OER in an undergraduate introductory course? Data analysis indicated that 39 out of 46 (84.7%) students who took the reflective survey and 25 out of 29 (86.2%) students who participated in the focus groups reported that they appreciated that there was not a required textbook in this course. Several themes concerning the advantages of using only OER emerged from the two data sources. These themes are discussed in detail below.

Cost saving. First and foremost, students knew from their senior counterparts or past instructors that a $60 textbook, with a new edition every year, had been traditionally required in this course. For this reason, 84% of the 46 students who took the reflective survey, and 88% of the 29 in the focus groups expressed overwhelming satisfaction with using OER in place of a traditional textbook. One student's comment was representative of many students' perceptions:

> One of the best things in this course is that there was no a required textbook. This is an introductory course, and I know a newer version is out every year. Thank you for not asking us to buy another expensive textbook when all we need is online.

Another participant added: "Technology is the way of the future. Textbooks are overpriced and soon to be outdated. The Internet and a printer are far better than a textbook because of the open resources available online." Clearly, the students were concerned about the upsurge in textbook costs. They appreciated that only OER were used in the course. As one student summarized, "I don't see why we need another expensive textbook when OER can do a great job as well, or even better."

Dynamic and plentiful materials. Another recurring theme was that OER enriched student learning because of the dynamic, multimedia online resources. One student explained the situation:

> This is an introductory technology course. It makes sense that we used OER to learn technology in a digital age. It would be a waste if we had to "read technology"' in a textbook. That will help us use OER effectively when we become teachers.

Another student noted: "I enjoyed not having to buy a book. I think I benefited as much from OER as I would have from a traditional textbook. It is the BEST CHOICE to make an introductory course interesting." Interestingly, this student's comment was not solely about the cost saving of OER, but highlights the way in which the use of OER can actually make a course more interesting. Another student noted:

> I am a third-year student taking this introductory course that I didn't take before. I never had a course that only used OER. It worked great in this introductory course. I hope my professors will use more OER in my senior year.

These comments indicate that students perceived multimedia-enriched OER as effectively contributing to their learning and viewed OER integration to be appropriate for an introductory course.

Mobile learning. The third most identified theme from the triangulated data is about OER and mobile learning. Specifically, 30 of 46 (65.2%) students who took the reflective survey and 23 of 29 (79.3%) in the focus groups indicated that OER enabled their mobile learning. One student noted that:

> Digital is much better as long as you have access to a computer at any time you need. There was no need for a textbook in this course and in several introductory courses I've taken either. All I need is online in the course site.

This student contextualized the convenience of not carrying a textbook into his or her mobile learning experience. One student added: "OER are simpler, and it is easier to get the homework done. When all my readings and submissions are online, I only need a computer to do my homework. I do not like dealing with textbooks and pens. Very cool." Another student also noted: "When I go to the class, the Libraries, or the Union, I can forget to bring my textbook, but I will never forget my laptop." These comments indicate that students perceived OER as a great convenience for mobile learning.

OER evaluation and copyright. Data analysis showed that 26 of 46 (56.5%) students in the reflective survey and 20 of 29 (68.9%) in the focus groups also commented on OER instructions in the context of the course. Some students indicated that course assignments encouraged students to pay due attention to copyright issues and the reliability of OER content. One student explained: "I learned to look closely whether the site is reliable and updated, and whether it is copyright free. These skills will definitely help me prepare my lesson plans when I become an in-service teacher in the future." Given that some OER might, at a glance, appear as legitimate sources when in fact they are not, the course instructor exerted great effort to help students evaluate OER and be cognizant of copyright implications for their assignments. One student commented on the instructor's effort: "I am glad that the professor often talked about copyright and fair use guidelines in the class. She made sure that our lesson plans had OER-supported activities and we didn't just copy and paste others' online lesson plans." Another student further explained that: "I got to know that some OER in the open domain can still have copyright implications." These comments indicated that simply providing OER was not enough to help students learn effectively.

In sum, students appreciated not having to purchase and carry textbooks, and their experiences with OER were positive overall. Students in the present study identified several major advantages of using only OER to replace traditional textbooks, summarized in Table 1. No outliers were found for the advantages of OER.

Table 1

Advantages of Using Online Resources to Replace Textbooks

Advantages	Descriptions
1. Cost Saving	Helps alleviate students' financial stress; encourages alternative textbook solutions.
2. Dynamic & Plentiful Materials	Motivates use of multiple learning styles; includes potentially unlimited resources not possible with the limited space of a print textbook.
3. Enabling Mobile Learning	No need to carry textbooks; encourage mobile learning in a digital age.
4. Supporting OER Evaluation Skills and Understanding Copyrights	Develops skills to evaluate and select reliable online materials; helps students become more copyright conscious.

Research Question 2

What challenges did students experience when using only OER in their learning process? Although the majority of the students appreciated a textbook alternative in the course, they also experienced some challenges in using only OER as the course materials. The following section addresses these challenges in detail.

The tactile sense. As seen in the data collected, 8 of 46 (17.3%) students in the survey and 7 of 29 (24.1%) students in the focus groups described "missing" the experience of working with a tangible textbook. Specifically, these students liked the touch of a book, and felt as though books made it easier for them to take notes. One student wrote:

> When it comes to studying, I would like to have a book with me. I like to feel it, read it, and take notes wherever I want instead of relying on a computer. OER are good to supplement the course, but I prefer to have a book at my fingertips.

This sentiment was not unique. Another student added: "If quizzes are going to be given, then something needs to be in print so students like me can have something on hand to study because I am a visual learner." Another student echoed that: "I feel like when it comes to prepare my final exam and homework, I really wish I could have a textbook in front of me." These comments indicated that some students missed the tactile sense of a textbook, and they believed that a traditional textbook was better than the intangible OER when it came to preparing for their exams and homework.

Internet accessibility. In terms of Internet accessibility, 31 out of 46 (67.3%) students lived off campus, and seven students indicated that they had Internet access, but they did not have high-speed Internet connections. One student expressed the following concern: "I like OER, but I don't have high-speed Internet in my apartment. I prefer to do my homework when I come to the campus." Another student added:

> I live off campus and don't have a fast Internet connection. I had to use computers on campus a lot to go over online materials. Sometimes, it was just easy to have a book on hand, read it, and do the assignments.

These students felt frustrated doing homework with a slow Internet connection. As a result, a course using only OER posed real challenges to their learning. One student explained the situation further: "I found it very challenging to do homework with solely OER in this course. If I lived on campus like last year, I should be fine, but my off-campus apartment this year doesn't have high-speed Internet."

Instruction and guidance. Six students in the survey reported that instructions of using OER were not clear to them. One student provided some context:

> I feel like I need the professor's help all the time because the scope of OER is too big. Also, some quiz items had nothing to do with what was discussed in class. I may have read it somewhere online, but I don't remember.

One student expressed the need for additional guidance due to the broad scope of OER used in the course: "I definitely need more help for the assignments because the amount of the online resources is just overwhelming." Wanting extra guidance could also be correlated with students' concern about not having a tangible textbook. Another student mentioned the same concern: "While I appreciate so much not to buy a textbook and I like OER in this course, I have to admit I got lost sometimes. You have to follow the professor's instructions and ask questions in a timely manner."

Self-regulation skills. Self-regulation "is the self-directive process by which learners transform their mental abilities into academic skills" (Zimmerman, 2002, p. 65). In the context of OER, it refers to the ability to stay focused and on track when using OER. Six students in the study also experienced lack of self-monitoring skills when learning with OER. They found it all too easy to spend hours visiting different Websites and often strayed from their purpose when their initial intention was to browse relevant OER for their assignments. One student described the double-edged sword of using OER: "Using only OER like this course is exciting as well as dangerous. If you don't keep an eye on where you visit, you can surf on the Internet forever and totally forget about your assignments." Another student reported a similar experience: "I found myself clicking on one link after another. I can easily spend hours visiting different Websites, like when you are on YouTube." Such comments indicated that the students could easily get sidetracked if they did not consciously monitor their time using OER, and that conscious monitoring of one's time using OER may be important to ensuring that students maintain focus on their coursework and learning. Table 2 summarized the challenges experienced by students, which did not reveal any outliers.

Table 2

Challenges When Using Only OER

Challenges	Descriptions
1. Lacking the Tactile Sense	OER are not tangible and cannot be physically annotated; there is nothing to read in hand to prepare for quizzes.
2. Slow Internet Connection	Some students cannot study at home because they do not have high-speed Internet connections off campus.
3. Unclear Instruction and Guidance	Need clearer and/or additional instructions on assignments; need extra guidance when using OER.
4. Insufficient Self-Regulation Skills	Can easily stray from the required OER and browse other sites; need time management and self-monitoring skills to stay on task.

Discussions and Implications

This study investigated 46 undergraduate students' perceptions of using only OER in an introductory course in a large American public university. OER advantages that students identified include textbook cost savings, that OER materials are dynamic and plentiful, that OER enable mobile learning, and that the use of OER can help students develop skills to evaluate and select reliable online materials and better understand copyright guidelines. Challenges that students experienced include missing the tactile sense (commonly associated with textbooks) when using OER, slow Internet connections, unclear instruction and guidance, and insufficient self-regulation skills. Based on these findings, several recommendations were drawn up for pedagogical purposes.

Course Structure and Preparation

The study examined an introductory course on technology integration. With this, students may have been primed to embrace OER (Cochrane, 2014). Further research is needed to better understand whether courses not specifically geared toward technology would have similar perceptions. Instructors should take into the consideration the nature of the course when deciding the weight of OER in a course (Hilton et al., 2013).

This study also found that course level, introductory or advanced, was an important factor affecting student perceptions of using OER to replace textbooks. In this study, some students indicated that since it was an introductory course that covered basic knowledge and practices, OER, therefore, would likely be widely available. The course instructor, however, did not make this same assumption. When looking for potential OER, the instructor experienced a great challenge in selecting quality OER content and in customizing

course design based on plentiful OER content. Such a challenge is in line with the literature. In a study of 2,700 instructors, it was revealed that challenges in evaluating quality OER were a great barrier of OER adoption (Babson Survey Research Group, 2017). Eighty instructors in eight colleges also reported that they spent a lot more time preparing for teaching because they were adapting and revising existing OER, or they were developing assignments and materials specific to OER content (Hilton, Bliss, & Wiley, 2013). It is recommended that instructors start small by incorporating a few OER components into their courses, and then add more OER gradually (Conole, 2013; Hegarty, 2015).

Student Learning with OER and Copyright

Teclehaimanot, Mentzer, and Hickman (2011) found that many instructors talked about integrating technology into their curriculum, but few provided students with exercises and activities to help them develop technology integration skills. The literature also suggests that students found it challenging when they were expected to evaluate the quality and credibility of OER content and incorporate such content into their discussions, assignments, and collaborative projects (Conole, 2013; Hegarty, 2015). When OER are used predominately in a course, students should learn to navigate OER content, and instructors should learn to teach students how to use OER to enhance collaborative thinking, perspectives, and mentoring (Bonk & Lee, 2017; Brown & Munger, 2010).

Another consideration for instructors is the importance of modeling copyright and fair use practices. The Digital Citizen Project from Illinois State University reiterated that digital natives do not necessarily have a solid understanding of intellectual property when using online materials for personal and academic purposes (Digital Natives and Intellectual Property, 2007). As indicated by some students in the present study, it is helpful for instructors to discuss copyright and model fair use on an ongoing basis in class. Students thereby become more copyright conscious when using online materials in general and in OER in particular.

Self-Regulation Skills and Connected Community

The present study found that self-monitoring is more critical when using only OER compared to when using traditional textbooks. Undoubtedly, it was tempting for students to explore additional OER outside the scope of the course, and not all students have self-monitoring skills in an OER-only pedagogy (Conole, 2014). The findings of the present study supported Bonk and Lee's (2017) study that students who stayed on task and satisfactorily completed their assignments in a timely manner benefited most from OER. Only six students identified challenges with self-regulation skills. Therefore, a correlation between unclear instruction and guidance and insufficient self-regulation skills cannot be safely concluded. However, one way that instructors can help students develop their self-regulation skills is to have their peers share their best self-directed learning strategies in an open environment (Chu & Tsai, 2009).

Instruction and Guidance

Clear instruction and guidance on using OER foster personalized learning experiences, problem solving, and critical thinking skills (Johnson et al., 2015). It is recommended that instructors continuously model OER evaluation, fair use, and general copyright guidelines, as well as learning strategy adaptations when new resources and opportunities are offered online (Kelly, 2014). By self-monitoring their own learning processes, students become meta-cognitively and behaviorally active in their own learning, so they are able

to navigate unfamiliar environments (Anderton, 2006; Bonk & Lee, 2017). Meta-cognitive strategies include planning, setting goals, monitoring actions, and evaluating progress. Behavioral strategies include choosing, adapting, and creating an environment for learning that optimizes learning experiences (Anderton, 2006).

Additionally, it is recommended that instructors repeat the instructions for assignments in different locations such as in the syllabus, in class, via e-mails, or through the course management system, as well as in assignment feedback, peer review, or reflective practices (Hilton & Bliss, 2013; Richter & Ehlers, 2011).

Technical Challenges

One challenge that students identified in the study was poor off-campus Internet connection. It is recommended that instructors make students aware of the possible challenges of using OER early in the course. Instructors could also offer some effective learning strategies to students such as avoiding procrastination, prioritizing tasks to study OER when on campus, and communicating with the instructor in a timely manner. Meanwhile, instructors need to be flexible concerning the design of assignments, due dates, and grading procedures in view of these challenges (Gil et al., 2013; Kelly, 2014). Flexibility is particularly important in the initial phase of implementation of OER (Feldstein et al., 2012).

Using only OER as instructional materials can also pose particular challenges to instructors. To ensure that the links of OER content remain active, the instructor of this study had to check regularly before and during every week of instruction, which required additional time and efforts compared to using a traditional textbook. Moreover, the course instructor realized that a course based on OER might lead to endless revisions when the instructor and the students identified better OER components after the completion of the course design. Just as students must develop self-monitoring skills, instructors must monitor their revisions so that they can focus on instruction rather than ceaseless course redesign (Cochrane, 2014; Johnson et al., 2015).

Contributions and Future Research

The study added new knowledge to the field of OER. Since most OER studies focus on the full adoption of e-Textbooks or partial adoption of OER components, this study investigated students' experience when using only OER in a course. The findings of the study at hand may contribute to course design, teaching, and faculty support of OER.

While the study provides insights concerning student perceptions of using only OER to replace traditional textbooks, it was limited by its small sample. Although identified OER benefits and challenges are consistent, the study can serve as a case study to aid further studies with larger populations to determine the mean value of the findings as well as pinpointing outliers. Additionally, since the course was focused on educational technology practices and stressed self-directed learning, the findings could be confounded by factors such as students' likes and dislikes of the course content, perceptions of self-regulated learning, technology skills prior to the course, and variations in the availability and quality of OER in different fields.

This study nonetheless provides a set of baseline data for future research that warrants further attention. Future research should investigate, in greater depth and in broader scope, whether the course level

(introductory vs. advanced course), nature of a course (technology-based vs. non technology-based course), instructor differences (OER novice vs. expert), student standing (freshmen vs. seniors), and class attendance (active vs. absent) make a difference in selecting, incorporating, and teaching with OER effectively when OER serves as the only instructional materials or as a supplement (Hegarty, 2015; Hilton & Bliss, 2013). Future research can also examine how to develop mechanisms to help instructors integrate OER into curriculum effectively and efficiently and to help students develop self-monitoring skills in an open learning environment (Hilton et al., 2013; Hilton, Bliss, & Wiley, 2013; Johnson et al., 2015).

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Understanding the Early Adjustment Experiences of Undergraduate Distance Education Students in South Africa

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Abstract

Much research in face-to-face contexts outlines the importance of early adjustment on students' higher education experiences. However, few studies have replicated this research in distance learning contexts to unpack the early multifaceted adjustments associated with studying in absence of a physical campus. This is particularly needed from a Global South perspective, where countries like South Africa have become regional hubs for distance learners. To explore distance learners' adjustment experiences, this study analysed results from a Student Adaptation to College Questionnaire (SACQ) with 320 distance learners at the University of South Africa, mixed with qualitative thematic analysis of open-ended questions. The results outlined key factors that impact distance learning experiences for students in South Africa, including demographic variables, class, language, and access to resources. These findings, compared with similar work in face-to-face contexts, suggest areas in need of additional support from distance education providers in South Africa and beyond.

Keywords: Distance education, higher education, student adjustment, South Africa

Introduction

Early experiences in higher education, such as during the first year of study or in the first course units, are particularly influential on students' success and attrition (Wilcox, Winn, & Fyvie-Gauld, 2005). While research on this topic tends to focus on face-to-face contexts, there has been increasing interest in early experiences in distance learning (Baxter, 2012; Brown, Hughes, Keppell, Hard, & Smith, 2015). This emergent body of research is particularly valuable, since notions of what the label first year means for flexible distance programmes may vary from typical face-to-face contexts (Baxter, 2012). However, empirical findings on this phenomenon are scarce, particularly from a Global South perspective, where distance learning is gaining popularity (Subotzky & Prinsloo, 2011). As such, an understanding of students' early adjustment experiences in distance learning contexts—defined as students' ability to cope with the multifaceted changes and stressors in their lives as a result of higher education study (Baker & Siryk, 1999; Tinto, 1998)—can provide particularly useful insights into support mechanisms necessary for success.

To address this, we focused on the adjustment experiences of distance learners in a first-year course unit at the University of South Africa (UNISA), which is one of the largest distance education providers in the world. Within the broader context of South African public higher education, success and retention are major concerns, particularly at UNISA with its large student numbers (Department of Higher Education and Training, 2012). While research into early student experiences is well-established in the South African higher education context generally (e.g., Kahu & Nelson, 2018), the specific context of distance education is still an emerging focus (e.g., Mahlangu & Fraser, 2017). As such, this study explored the factors impacting students' distance learning adjustment experiences through a mixed methods questionnaire of 320 students at UNISA, providing a clearer understanding of distance learners' first-year experiences.

Literature Overview

Adjustment Experiences in Distance Education

A wide variety of literature from around the world outlines that adjustment to the multifaceted transitions associated with higher education study impacts student success (Credé & Niehorster, 2012). The early models of Spady (1970), Tinto (1975), and others attempted to map not only the role of variables that may impact students' decisions to continue with their studies or to drop out, but also how these variables intersect, and whether they are interdependent or mutually constitutive. Indeed, research on success and retention in higher education, and more specifically distance education, includes a range of approaches and perspectives (Subotzky & Prinsloo, 2011).

Of specific interest to those researching students' early experiences in distance education is the notion that it is possible to cluster the various factors that impact success "at three related levels: individual (academic and attitudinal attributes, access to resources, and other personal characteristics and circumstances), institutional (quality and relevance of academic, non-academic, and administrative services), and supra-institutional (macro-political and socio-economic factors)" (Subotzky & Prinsloo, 2011, p. 179). It is, therefore, crucial to remember that students' experiences will be impacted at all three levels. For example, some of the published research on South African distance education outlines issues such as access to materials and resources (Halabi, Essop, Carmichael, & Steyn, 2014; Swart, 2015), developing social connections among students from different geographical contexts (Meier, 2007), and

synchronous versus asynchronous activity offerings (Olivier, 2016). However, there are relatively few studies that have replicated research specifically into student adjustment in distance learning contexts, which arises in combination or as a result of these factors.

In the research on student adjustment, it is evident that the first year of study is particularly influential, as outlined by early research in face-to-face settings (Tinto, 1998; Upcraft & Gardner, 1999). In the South African higher education context, the experiences of first-year students have gained considerable traction (Leibowitz, Van der Merwe, & Van Schalkwyk, 2009). For example, McGhie (2017) described factors impacting students' experiences, including preparation for university coursework, workload, overcrowded timetables, and having (or not) the necessary social and academic capital to develop personal strategies to overcome these challenges. Similarly, Lekena and Bayaga (2018) noted that over "50 per cent of students, typically those from low-income or deprived circumstances, drop out due to financial struggles to carry the direct and indirect costs of university attendance" (p. 157). Other factors influencing the first-year experience in South Africa include family and support structures (Daniels, 2017), tutors (McKay, 2016), support services (Jordaan, 2016), and higher-order thinking skills (Faragher & Huijser, 2014).

Yet to the best of our knowledge, outside of the research of McKay (2016) that focuses on the role of tutors in first-year experiences in distance education, there is no systematic research on students' early experiences in South African distance education. This represents a major gap in current knowledge, considering the high level of distance education enrolment, and unique social and political contexts in South Africa. These considerations are highlighted next.

The South African and UNISA Contexts

South African public higher education faces many of the obstacles seen elsewhere, including massification, funding regime changes, and changing student profiles (Altbach, Reisberg, & Rumbley, 2009). However, also present is the impact of intergenerational legacies of colonialism and apartheid on public higher education (Badat, 2005), which has had profound implications for access to higher education as well as the resources required to study successfully. In this sense, South African higher education is "sandwiched between systemic contextual problems inherited from past educational policies . . . and a generation of limitless possibilities" (Bozalek & Ng'ambi, 2015, p. 3). It would, therefore, be disingenuous to consider the students' experience at one particular distance education provider in South Africa without considering that we are "condemned to context" (Tessmer & Richey, 1997, p. 88).

Distance education functions as a substantial subsystem in South African higher education, contributing up to 40% of higher education students (Department of Higher Education and Training, 2014). Until 2013, UNISA was the only higher education institution in South Africa licenced to offer distance education and, in response, it grew into a mega-university with almost 360,000 students. While there are 23 public universities in South Africa, UNISA hosts almost 300,000 more students than any other South African institution.

Despite this large student cohort, the institution only graduates approximately 30,000 students a year (i.e., less than 10%), which suggests that many students experience challenges. In light of this, the specific academic, social, and emotional experiences of students at UNISA are of concern. In particular,

research is needed to unpack why some students in South African distance education succeed while others struggle.

Conceptual Framework

Literature around the world has focused on how transitions throughout the higher education experience impact student success (Credé & Niehorster, 2012). Seminal to this discussion is the work of Tinto (1975, 1998), who argued that higher education students' academic and social adjustments could explain differences in degree outcomes. Baker and Siryk (1999) built upon this work by suggesting that, in addition to academic and social adjustment, emotional adjustment and attachment to the university also play important roles. The four categories comprising this framework, measured by their Student Adaptation to College Questionnaire (SACQ), are outlined in Table 1. Although developed for face-to-face contexts, this conceptual framework links with previously established models for online learning, such as the Community of Inquiry framework, where key components of online learning include social, cognitive, and teaching presence (Garrison, 2011).

Table 1

Defined Categories of Student Adjustment

Category	Definition
Academic adjustment	How well students manage the educational demands of the university experience
Social adjustment	How well students deal with interpersonal experiences at the university (e.g., making friends, joining groups)
Emotional adjustment	How well students maintain emotional equilibrium, particularly in the face of adjustment stressors
Attachment	The degree of identification with and commitment to the university

Note. Based on Baker & Siryk, 1999; Tinto, 1998.

Internationally, much work identifies that these four adjustment categories can predict academic performance and retention (Rienties et al., 2012), as highlighted by a recent meta-analysis of 237 studies and 44,668 students from around the world (Credé & Niehorster, 2012). Specific to South Africa, Petersen, Louw, Dumont, and Malope (2009) used this model to evaluate the experiences of disadvantaged students, and found links between adjustment and performance. Sommer and Dumont (2011) also found that adjustment experiences could be explained by factors such as perceived stress or work overload. Similarly, Sennett, Finchilescu, Gibson, and Strauss (2003) considered the impact of demographic variables, such as race and gender, on adjustment experiences in South Africa and found that black African students had lower levels of social and emotional adjustment. More recently, Papageorgiou and Callaghan (2018) outlined that South African students' personality traits can influence their degree of academic adjustment. Altogether, these findings highlight adjustment as a key consideration for higher education students, with a broad range of demographic and institutional factors impacting their experiences.

However, much of this research was undertaken in face-to-face contexts and, to the best of our knowledge, no studies have replicated these findings with distance learners to understand how their

experiences might differ. In particular, more work is needed from the Global South perspective, whereby students may have different experiences of agency, capital, and self-efficacy (Subotzky & Prinsloo, 2011). Therefore, this study aimed to bring together these various strands of research to address the following research questions:

1. What are the adjustment experiences of distance learners in South African higher education?

2. What factors impact the adjustment experiences of distance learners in South African higher education?

Methods

Setting and Procedure

This research took place at UNISA in a first-year level course unit with undergraduate students studying for a Bachelor of Science degree in Mathematics and Programming in the College of Science, Engineering and Technology. This was a purposeful sample, as the academics teaching the selected courses volunteered to participate in a wider study as part of the International Distance Education and African Students (IDEAS) project. The data that supports the findings of this study will be available via UK data ReShare once the project is finished.

UNISA's modules are taught using a blended distance model, with digitally-supported materials and printed materials available for the many students with limited Internet access. All courses in the sample had an online presence in the learning management system, but online engagement was not required. Students were required to buy textbooks for self-study, while additional exercises or materials were hosted online. Pastoral support services were offered at the university by telephone, email, or face-to-face by non-compulsory tutorial support programs at a range of regional centres. In terms of social connections among students, online tools such as an online forum and social media are frequently used to develop a student community. All programmes and examinations in this faculty are taught in English, although only a small percentage of students are native speakers. This means there are likely a range of competencies with English language across individual students, although there is no systematic data collection on this at the university.

Participants

All students in the selected programme were contacted via their university email address with a link to the online survey. Altogether, 320 students participated, which is a reasonable response rate of 11.77% (Nulty, 2008). The majority were male (n = 216, 68%), which is in line with demographics in the programme. In terms of citizenship, 270 were South African (84%) and 36 were international students (11%) from 16 countries across Africa (14 declined to provide information about nationality). Most students were black African (n = 228, 71%), while 48 were white (15%), 17 were Indian or Asian (5%), 12 were coloured (4%),[i] and 5 declined to disclose their race. The majority of participants were non-native English speakers (n = 247, 69%). Only 24% of students in this study (n = 87) were full-time students, which is common in flexible distance learning contexts. Many participants had additional commitments beyond studying, including full-time (n = 172, 48%) or part-time (n = 30, 8%) work. Altogether, the sample is a reasonable representation of the student population in this programme.

Materials

This research incorporated a mixed methods methodology (Creswell & Plano Clark, 2011) using a questionnaire that included both quantitative and qualitative questions. As outlined in our Conceptual Framework section and by Baker and Siryk (1999), this study aimed to understand students' adjustments to the multifaceted transitions associated with studying at a distance from a South African institution. To measure these experiences and address research question one, the Student Adaptation to College Questionnaire (SACQ) was employed (Baker & Siryk, 1999). SACQ measures students' experiences across four subscales, based on the categories defined in Table 1. The SACQ questionnaire has been previously used successfully in the South African higher education context (Davidowitz & Schreiber, 2008; Papageorgiou & Callaghan, 2018; Petersen et al., 2009; Sennett et al., 2003; Sommer & Dumont, 2011). However, as UNISA students study at a distance and often have limited Internet access, we aimed to shorten the original instrument to ensure that it was fit for purpose in this context and to avoid questionnaire fatigue. Building on an extensive validation process of 1200 responses of students from nine universities in the Netherlands (Rienties et al., 2012), we selected the items with highest factor loadings from this previous work that were relevant for distance learning contexts, thereby reducing the questionnaire from 69 to 35 items. For more information about the scale and the validity and reliability of its shortened version, please see Rienties et al. (2012). Participants were asked to rate their agreement on a 1 to 9 Likert scale (1 = strongly disagree, 9 = strongly agree). As this faculty teaches all course units and conducts all examinations in English, we also opted to conduct this study in English as it was the common university language that was most familiar to participants.

To assess the validity and appropriateness of the instrument in the South African distance learning context, the full instrument was piloted with 16 UNISA students using a think-aloud protocol, which indicated that questions were clear and relevant to students' experiences. Cronbach alphas of each scale also indicated good internal reliability (academic adjustment, $\alpha = .781$; social adjustment, $\alpha = .782$; emotional adjustment, $\alpha = .701$; and attachment, $\alpha = .845$). Additionally, the questionnaire was analysed using factor analysis, which indicated good fit for the four constructs.

As research question two focused on factors that impact distance learning experiences in South Africa, questions related to students' backgrounds and demographics were included. These included questions about gender, race, country of citizenship, access to resources required for study (e.g., Internet, computer, mobile phone), language, and employment status. Additionally, participants were asked two open-ended questions, which provided a more in-depth qualitative perspective: (a) Is there anything that has positively influenced your UNISA experience? and (b) Is there anything that has negatively affected your UNISA experience?

Data Analysis

For quantitative data, normality was assessed by a visual review of normal distribution curves and analysis of skewness/kurtosis, to which all data was within the acceptable limits of ±2.00 (Field, 2013). Interpretation was aided by coding categorical variables (i.e., gender, race, citizenship, English as first language, full-time student status, and access to various technologies) as dummy binary values. This allowed us to compare experiences of students from different backgrounds, for example, South African students compared to non-South African students. To compare SACQ scale scores with participants' demographic variables, bivariate analysis using Pearson's *r* was conducted. Regression analyses were additionally calculated with each SACQ scale as the dependent variable and participants' background characteristics as independent variables.

For qualitative open-ended responses, thematic analysis was conducted using the six-step protocol suggested by Braun and Clarke (2006). Altogether, 19 themes were identified by the researchers, which were clustered around the four SACQ scales to aid interpretation. Given that a large research team was involved in the qualitative analysis, steps were taken to compare our understandings of the codes and themes. First, after the codes were initially developed, a second member of the research team individually coded 50 responses to the questionnaire. Cohen's kappa was used to assess inter-rater reliability, which indicated good agreement (κ = .869). Afterwards, the two researchers compared perspectives and made revisions to the codes. Next, a third member of the research team analysed a different selection of 50 responses using the revised codes. Cohen's kappa again indicated good agreement (κ = 776), which was confirmed through in-depth group discussions.

As a lens for our thematic qualitative analysis, we used a k-means cluster analysis to group participants based on their SACQ scores, as conducted in previous work by the authors (Mittelmeier et al., 2018). Cluster analysis is a method for sorting data into groups based on similar traits, in our case, SACQ scores. K-means cluster analysis was deemed appropriate for grouping participants based on their SACQ scores because the variables were numerical and on an interval scale (Everitt, Landau, Leese, & Stahl, 2011). ANOVA F-value scores were compared as a proxy for cluster analysis, which determined that four clusters were the best fit for the data, as described in Table 2 (Field, 2013). Altogether, this approach allowed us to explore different types of student experiences across the qualitative data and to compare factors that may have impacted their adjustment.

Table 2

Clustering of Students Using K-Means Cluster Analysis

Cluster #	Definition	Average academic adjustment	Average social adjustment	Average emotional adjustment	Average attachment
Cluster 1	Students who scored relatively high on all four SACQ adjustment scales.	7.10	6.91	6.85	8.24
Cluster 2	Students who scored relatively low on all four SACQ adjustment scales.	4.56	4.30	3.97	4.95
Cluster 3	Students who scored relatively high on most SACQ scales, but scored low on social adjustment.	6.91	4.63	7.15	7.78
Cluster 4	Students who scored relatively low on most SACQ scales, but scored high on attachment.	5.90	4.93	4.85	7.38

Results

Quantitative Results

Average SACQ scores. In terms of research question one, Table 3 shows average scores for each SACQ scale, indicating that students felt generally positive about their distance learning experience.

The lowest average scores were in relation to social and emotional adjustment, which is logical considering the absence of a physical campus community for distance learners. On average, participants also demonstrated a high level of attachment towards the university.

Table 3

Average SACQ Scale Scores

Scale	*M*	*SD*
Academic adjustment	6.27	1.25
Social adjustment	5.40	1.44
Emotional adjustment	5.80	1.55
Attachment	7.33	1.42

Note. Items were scored on a 1 to 9 scale.

However, there was strong variation among students, as evidenced by the large standard deviations for each scale (Table 3). An example of this wide variation is depicted graphically in Figure 1, which suggests there are additional factors impacting students' reflections on their distance learning experiences.

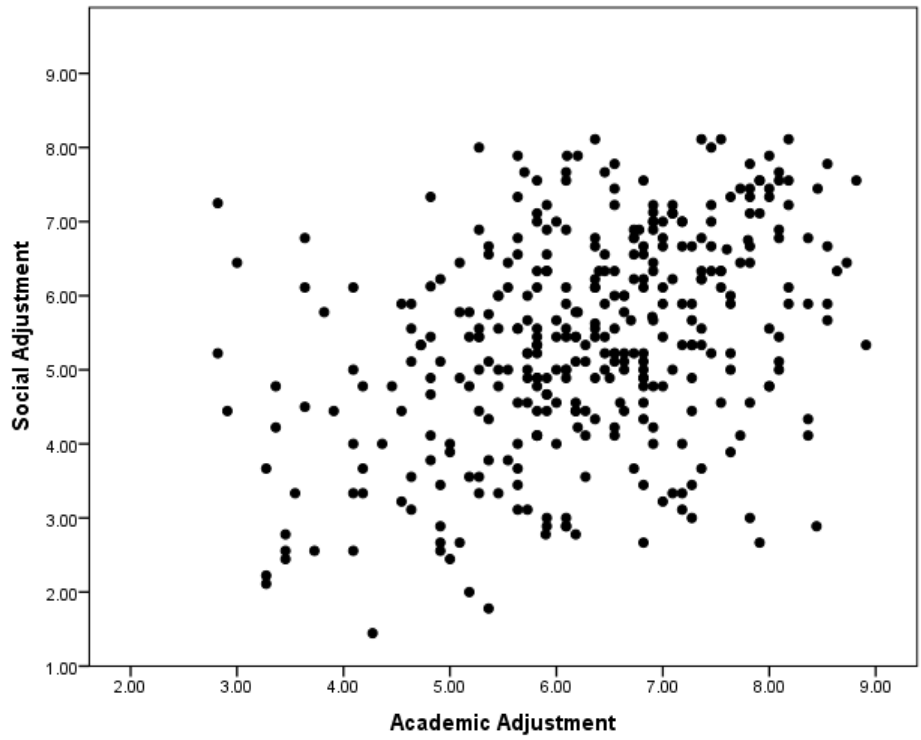

Figure 1. Scatterplot of SACQ academic and social adjustment scores (scored on a 1 to 9 scale).

Correlation between SACQ scores and demographic variables. Bivariate analysis between the individual SACQ scores and various background and demographic variables was conducted using Pearson's *r*, which is highlighted in Table 4.

The strong correlations between the four SACQ scales highlighted that adjustment is multifaceted and often interlinked. This analysis also indicated relationships between demographic variables and the adjustment scales. For example, there was a negative correlation between gender and emotional adjustment, with women less likely to reflect positively on their emotional adjustment experiences. A relationship between race and adjustment was also found, with black African students more likely to reflect positively on their social adjustment and attachment to the university compared to students from other racial groups. As well, there was a weak and negative correlation between language and all four adjustment categories, meaning those who spoke English as their first language were more likely to reflect negatively on their university experiences.

In addition to demographic variables, access to resources was highlighted in Table 4 as an important factor in adjustment experiences, particularly in the area of academic and social adjustment. Positive correlations were found between academic adjustment and access to resources (including a computer, mobile phone, and Internet). Therefore, while distance learning had a moderating effect for issues such as race and language, class issues may still permeate the extent to which students feel academically adjusted to the demands of study. At the same time, there was a negative correlation between social adjustment and access to resources, meaning those with access to resources required for distance study reflected more negatively on their social experiences in distance learning. One reason for this could be that students without access to technologies were more likely to access computer laboratories in regional centres, thereby feeling more connected with a physical university community. Therefore, questions remain about what steps can be taken to socially integrate students who primarily work at home and away from a physical campus.

Table 4

Bivariate Analysis of SACQ Scores and Demographic Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Academic adjustment	--	--	--	--	--	--	--	--	--	--	--	--	--
2. Social adjustment	.391**	--	--	--	--	--	--	--	--	--	--	--	--
3. Emotional adjustment	.627**	.324**	--	--	--	--	--	--	--	--	--	--	--
4. Attachment	.633**	.408**	.516**	--	--	--	--	--	--	--	--	--	--
5. Age	-.032	.049	.056	.031	--	--	--	--	--	--	--	--	--
6. Gender	-.093	-.003	-.237**	-.090	-.099+	--	--	--	--	--	--	--	--
7. Race: black African	.094+	.217**	.065	.155**	.098+	-.019	--	--	--	--	--	--	--
8. South African	-.046	-.041	-.083	-.056	-.019	.020	-.122*	--	--	--	--	--	--
9. English as first language	-.143*	-.142*	-.119*	-.135*	-.012	-.005	-.340**	.109*	--	--	--	--	--
10. Full -time student	.082	.035	-.046	.041	-.365**	.046	-.031	-.021	.035	--	--	--	--
11. Computer at home	.125*	-.087	.086	.008	.085	-.105+	.015	.011	.037	-.081	--	--	--
12. Internet at home	.076	-.061	.003	-.028	.025	-.024	-.167**	-.028	.079	.030	.487**	--	--
13. Mobile phone access	.115*	-.104*	.029	.000	.051	-.014	.022	.010	.122*	-.106*	.425**	.350**	--
14. Quiet working space at home	.113*	-.151**	.090+	.046	-.044	-.064	-.129*	-.098+	.063	.049	.372**	.360**	.463**

** $p < .01$
* $p < .05$
+ $p < .1$

Regression analysis. These findings were further unpacked using regression analyses with the SACQ scales as dependent variables and demographic information as independent variables, as outlined in Table 5. These findings, again, highlighted that there are demographic influences in the ways in which students reflect upon their distance learning experiences. In particular, significant factors in the regression analyses included language, race, and gender.

Table 5

Regression Analyses of SACQ Scales and Demographic Variables (Standardised Beta Coefficients)

	Academic adjustment	Social adjustment	Emotional adjustment	Attachment
Age	-.028	.058	.020	.043
Gender	-.085	-.006	-.222**	-.082
Race: Black African	.049	.200**	.034	.170*
South African	-.074	.012	-.110*	-.072
English as first language	-.163**	-.067	-.127*	-.088
Full-time student	.096	.056	-.022	.070
Computer at home	.051	-.033	.052	.013
Internet at home	.022	.050	-.038	-.012
Mobile phone	.082	-.052	-.012	.006
Quiet working space at home	.047	-.089	.100	.098
Adjusted R^2	.035	.059	.066	.035

** $p < .01$
* $p < .05$

In line with previous work using the SACQ in South Africa (Petersen et al., 2009), demographic variables could explain only a relatively small percentage of variation among participants. This means that other experiences have interlinked or parallel influences on students' adjustment experiences. To illuminate this for research question two, the next section summarises themes from the survey's open-ended questions to provide a richer, qualitative understanding of the quantitative findings.

Qualitative Results

Flexibility of distance learning. Considering the high percentage of part-time learners and those with full- or part-time work commitments, many participants across the four clusters positively reflected on how the flexibility of distance learning allowed them to incorporate education into their existing lives and commitments, indicating a relatively universal perspective.

> Studying at UNISA for education gives me enough time, as I'm currently working as a teacher. The time I'm given for my assignments is also reasonable. (Participant 128, female, South African student, Cluster 3)

> They gave us many chances to do our work, so any challenges in my life won't cause me to miss most of my activities. (Participant 163, male, South African student, Cluster 4)

For some students, this flexibility was key to accessing higher education and developing (perceived) social mobility. Such comments were particularly prevalent from students in Cluster 4 (i.e., those with high attachment to the university, but relatively low academic, social, or emotional adjustment). Overall, this indicated that, despite perceived adjustment difficulties, appreciation of the distance learning format supports students' overall attachment to the university.

> UNISA gives us the opportunity to study part-time and gives us access to education. The model is a good model that allows for greater access to education. (Participant 27, male, international student, Cluster 4)

> I've managed to make a living while I'm studying at UNISA. It's a well-recognised institution. I found my previous job due to the fact that I was studying with UNISA. Since I am from a disadvantaged family, I found it easy to believe that I could still reach my goal. (Participant 47, male, South African student, Cluster 4)

In our quantitative findings, most students demonstrated relatively high attachment to the university, despite academic, social, and emotional adjustment hurdles. These qualitative responses shed light on this phenomenon, outlining the role of distance learning in providing an alternative route to higher education.

Independent studying and learning. Participants noted that distance learning required a high level of independent studying and self-sufficiency. On the one hand, some participants noted that studying independently helped them gain new skills and insights, such as time management, self-reliance, and independence. This was particularly prevalent for Cluster 1 students (i.e., those who scored relatively high on all four adjustment scales), demonstrating more positive reflection from those with better adjustment experiences.

> My time managed [sic] skill has improved, also with the commitment towards my studies. It has surely taught me to commit also to other things than my studies. (Participant 88, male, South African student, Cluster 1)

On the other hand, other students frequently cited frustrations with learning independently, including difficulties understanding tasks on their own or lack of timely feedback. This was more frequently demonstrated by those with lower adjustment scales, such as Cluster 2 (i.e., those with relatively low adjustment scores in all four categories).

> I struggle to motivate myself to work. When I have trouble with something, it's difficult to get in contact with someone who can help me. (Participant 256, female, South African student, Cluster 2)

Therefore, one reason for the variation among clusters (i.e., those with similar SACQ score patterns) could be coping mechanisms related to students' comfort and competence with self-study in absence of a physical classroom.

Access to resources and technology. In our quantitative findings, access to resources required for study (e.g., computer, mobile phone, Internet) was linked to positive academic adjustment. This was also frequently discussed by participants in the qualitative open-ended comments. In particular, many participants noted issues with receiving or accessing course materials. This was especially prevalent among students across the four clusters who were living in rural communities or outside South Africa, which helps clarify some of the underlying issues that affect students' access to resources.

> Not having my study material on time. I ended up not submitting my semester 1 assignments and also requesting a book from the library not knowing it'll take weeks before being delivered and by that time I no longer needed. (Participant 262, female, South African student, Cluster 2)

In some cases, lack of access to materials was cited as a major disruption in students' learning or ability to continue with the course. These findings were more frequent for those with lower overall SACQ scores (Clusters 2 and 4), indicating access to materials played an important role in the adjustment challenges experienced by some students.

> I had to cancel drawing because I couldn't get the textbook and paying for school myself is a lot to loose [sic], 2500, which I have to pay again next semester. (Participant 249, female, South African student, Cluster 2)

> I have find it difficult to do some of my assignments due to the limited textbooks. I have failed to submit my assignment because only the book late and I am not going to write exam for one of my subjects due to shortage of books. (Participant 207, female, South African student, Cluster 4)

Participants in these clusters also explained that their adjustment experiences were impacted by access to resources.

> Studying online was very difficult for me because most of the time I don't get access to Internet, because UNISA labs are always full and I'm not using a smartphone. (Participant 260, female, South African student, Cluster 2)

Altogether, these findings highlight inequalities in access to materials required for study, which has, in turn, impacted students' adjustment experiences in distance learning.

Physical distance. Although UNISA does operate regional centres and occasionally holds optional in-person tutorials or practical sessions, it was frequently noted that not all participants had the ability to travel to or attend these sessions. This was particularly the case for those across the four clusters who live in rural areas or at a long distance from centres, and those with work or family commitments. Ability to pay for transportation to regional centres was also frequently noted as a concern.

> I cannot attend tutorial because they start late and I'm staying far from the campus. I did not attend my practical at Florida campus because I can't afford the transport and accommodation that side. (Participant 13, unknown gender or nationality, Cluster 2)

This physical distance also had implications for whether students felt socially connected with other students. Perhaps one explanation for variations in social adjustment scores, therefore, could be varying levels of physical isolation from university environments. After all, this was particularly prevalent for those in clusters with relatively low social adjustment.

> I would say that it is hard to build relationships with other students if you are not close to any regional office. I wish there was an easier way. (Participant 113, male, South African student, Cluster 4)

> The fact that we are not given a class list with students' details or perhaps something like an online class, influences one's morale and confidence in the subject. (Participant 184, female, South African student, Cluster 4)

While access to physical buildings was not a prerequisite for distance learners, students in low SACQ score clusters often noted frustration with communicating with the university or their lecturers.

> Some subjects and lecturers are excellent, a lot of communication, and nearly no support needed due to just communicating. Others you go through an entire semester with unanswered questions and unclarity [sic]. (Participant 200, female, South African student, Cluster 2)

Altogether, these findings outline the physical isolation of distance education as a common source of frustration for some students, which impacted their adjustment experiences.

Fees and funding. The open-ended comments revealed that tuition fees were a common source of stress and frustration for participants. In particular, participants noted burdens of self-funding and paying for fees not covered by the National Student Financial Aid Scheme (NSFAS). These concerns were prevalent across all four clusters of SACQ scores.

> Financial support makes me lose my courage because even though I am about to complete my degree but I sometimes feel threatened by financial aid. (Participant 69, male, South African student, Cluster 4)

> NSFAS did not pay for all my tuition fee and since I do not have parents, no one can buy for me and I'm even struggling for money to come to school. (Participant 236, female, South African student, Cluster 1)

For international students, there were additional stressors related to paying for courses from abroad. For example:

> The only worry now is the method of payment. I know the favorite method is through credit card but this is not working in Uganda where I come from yet. (Participant 126, male, international student, Cluster 3)

Altogether, financial stressors appeared prevalent for many students across all adjustment categories. This links with our suggestion in the quantitative findings that class may play an important role in the ways in which students feel adjusted to distance learning.

Discussion

The rise in popularity of distance education in South Africa, combined with the comparative lack of research into distance students' adjustment experiences, highlights a critical gap in current knowledge. This present study aimed to address this by examining students' adjustment experiences at UNISA, one of the largest distance education providers in the world. In doing so, the study explored: (a) contributing demographic variables affecting students' adjustment, and (b) factors that positively and negatively impacted their distance learning experience.

Research Question One

Our cluster analysis of SACQ scores indicated there was a wide range of adjustment experiences, which could be divided into four categories (highlighted in Table 2). The results further suggested that all four categories of adjustment could be partially explained by demographic factors. However, the variation in adjustment among demographic groups had only low to medium effect sizes (between 3.5% and 6.6%). This initially indicated that other factors outside of demographics more strongly influence students' experiences.

The largest demographic contributors to differences in adjustment levels were language and race. In both instances, adjustment patterns were against the 'norm', with more traditionally marginalised populations demonstrating better adjustment. For instance, we found in our bivariate and regression analyses that students who were not native English speakers were better adjusted across the four categories we measured. This is interesting, considering less than 10% of the South African population are native English speakers (Statistics South Africa, 2012) and native English speakers represent historically privileged groups (i.e., those with white British colonial heritage). In the same analyses, race was one of the strongest predictors in our findings, particularly in regards to social adjustment and attachment to the university. Black African students in our study reported significantly better adjustment compared to students from other racial groups. This is in contrast to previous research in face-to-face contexts in South Africa, whereby black African students were found to be less adjusted compared to white students (Sennett et al., 2003). Together, perhaps these findings speak to the role that distance education plays in South Africa, operating as an alternative route to accessing higher education for historically marginalised or underprivileged groups. This is further supported by the overall strong attachment to the university across our four student clusters, including the sizeable Cluster 4, namely students with overall low adjustment but nevertheless strong attachment. In this way, it seems that despite the struggles associated with distance education and dissatisfaction with the experience, some students have a strong attachment to the university that is largely linked to their appreciation of increased access to higher education through distance learning. Therefore, additional research might further unpack this notion through an explicit investigation of the role and function of distance learning to the lives of students in Global South contexts.

Research Question Two

Our second research question considered other factors beyond demographics that impacted students' distance learning experiences. In this regard, all clusters of students reported in the qualitative open-ended questions that the main challenges they faced were in relation to fees and funding, along with timely access to resources required for study (e.g., books, learning materials, technology, tutors) in line with work by Lekena and Bayaga (2018). This, as also found in prior research (Halabi et al., 2014; Swart, 2015), outlines the important role of class in students' distance learning experiences. For example, ability to pay university fees and have access to required study materials were the main points that distinguished students among the different SACQ clusters in our study. The most dissatisfied group of students—Cluster 2, who showed the lowest adjustment and attachment—struggled most with funding and access to resources, combined with difficulties related to independent studying and feelings of isolation. Altogether, these findings suggest that when designing modules, distance learning institutions, particularly those serving students in the Global South, should be mindful of the accessibility of resources, technologies, and activities (see also our prior work: Mittelmeier et al., 2018).

The results from the open-ended questions supported the notion that students' academic, social, and emotional adjustments were largely influenced by the positive and negative experiences they had during their initial period of studying at the university. This further demonstrates that the importance of early experiences outlined in face-to-face contexts (Leibowitz et al., 2009; Upcraft & Gardner, 1999; Wilcox et al., 2005) similarly applies in distance settings. However, the wide range of adjustment experiences we discovered suggests students had varying levels of resilience, study skills, and coping mechanisms. These findings are in line with previous research by Sommer and Dumont (2011), who found that adjustment experiences in face-to-face contexts could be explained by factors such as perceived stress or work overload. In this regard, our findings imply strong inequalities among groups of students in terms of physical isolation, social community development, and access to timely feedback. Thus, the challenges existing across different levels in distance learning (Subotzky & Prinsloo, 2011) seem to disproportionately affect students with fewer resources (e.g., transportation, technology, finances, time). As such, this study has prompted important questions for future research around distance education and privilege, keeping in mind that access to higher education is as much about the ability to succeed as it is the ability to enrol.

Limitations and Conclusions

This study has provided a macro-level analysis of distance education students' experiences while studying through a South African institution and has highlighted suggested areas for future research. In doing so, several limitations are recognised. For one, this research utilises self-report measurements and we note that more research will be necessary in the future to unpack how these reflective experiences relate to measurable learning behaviours. We also recognise that students in our sample were studying in a STEM field and experiences may vary for students in other fields, which is a clear area for additional research. Finally, we recognise that the student population at UNISA is exceptionally diverse, including thousands of international students living across Africa and the world, and more research is needed to unpack the experiences of their particular situations. Nonetheless, this research has provided an important starting point for conversations around supporting distance learners' adjustment experiences and the role of distance learning in students' lives. In particular, we have outlined the important role of issues such as race and class in influencing South African distance students' adjustment experiences—an area in clear need of further research and conceptualisation, both within and outside of South Africa.

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[i] These four racial categories are defined by the South African government and asked of students in response to post-1994 legislation and regulatory frameworks.

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Goal Setting and MOOC Completion: A Study on the Role of Self-Regulated Learning in Student Performance in Massive Open Online Courses

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Abstract

Despite providing advanced coursework online to learners around the world, massive open online courses (MOOCs) have had notoriously low completion rates. Self-regulated learning (SRL) frames strategies that students can use to enhance motivation and promote their engagement, persistence, and performance self-monitoring. Understanding which SRL subprocesses are most relevant to the MOOC learning context can guide course designers and instructors on how to incorporate key SRL aspects into the design and delivery of MOOCs. Through surveying 643 MOOC students using the Online Self-Regulated Learning Questionnaire (OSLQ), the present study sought to understand the differences in the use of SRL between those who completed their course and those who did not. MOOC completers were found to have significantly higher applications of one SRL specific subprocess, namely goal setting. Additional SRL subprocesses of task interest/values, causal attribution, time management, self-efficacy, and goal-orientation also emerged from an analysis of open-ended responses as key contributors to course completion. The findings from this study provide further support regarding the role of SRL in MOOC student performance and offer insight into learners' perceptions on the importance of SRL subprocesses in reaching course completion.

Keywords: self-regulated learning, SRL, massive open online course, MOOC completion, online self-regulated learning questionnaire, OSLQ, goal setting

Introduction

The proliferation of massive open online courses (MOOCs) in the past decade has been a whirlwind. Beginning with George Siemens and Stephen Downes's *Connectivism and Connective Knowledge* (referred to as *CCK08*) course in 2008, MOOCs have expanded access to course content for learners around the globe. In 2017, there were about 9,400 MOOCs offered by more than 800 universities worldwide, with over 81 million students signing up for at least one course (Shah, 2018). Another indicator of the rapid growth of MOOCs can be found in the percentage of higher education institutions in the United States offering MOOCs. According to Allen, Seaman, Poulin, and Strout (2016), there has been a substantial increase of institutions offering MOOCs in the United States from 2.6% in 2012 to 13.6% in 2015. Furthermore, several prominent MOOC platforms, including Coursera and EdX, have partnered with universities to deliver credit-bearing courses leading to degrees (Agarwal, 2015; Straumsheim, 2016). With such growth and global reach, MOOCs offer great potential for expanding worldwide access to online continuing education and professional learning opportunities.

Despite such promise and popularity, the typically low completion rates of MOOCs have been concerning to MOOC providers (Yuan & Powell, 2013). For example, a study of 39 MOOCs offered through Coursera and EdX reported MOOC completion rates ranging from 0.9% to 36.1%, with a median of 6.5% (Jordan, 2014). It is worthwhile to note that students may have reasons for enrolling in MOOCs beyond intending to complete a course, such as shopping for potential courses to eventually complete, dabbling in specific course topics that are of interest, and auditing to increase knowledge about the course material but without a desire to complete any assignments (DeBoer, Ho, Stump, & Breslow, 2014). However, higher completion rates have been observed among MOOC students who paid for certificates; even so, the completion rate median for fee-based certificates tops out around 60% (Chuang & Ho, 2016). Therefore, MOOC completion rates are still a pressing issue regardless of students' payment status.

The factors affecting student performance in MOOCs are complex and varied, including learner engagement (Jung & Lee, 2018; Nawrot & Doucet, 2014), declaration of intention to complete (Reich, 2014; Wang & Baker, 2018), and motivation for career advancement (Watted & Barak, 2018). Learner persistence in MOOCs has also been linked to learners' perceptions of teaching presence (Gregori, Zhang, Galvan–Fernández, de Asís, & Fernández–Navarro, 2018; Hone & El-Said, 2016) and the ease of use of the course platform (Jung & Lee, 2018). Finally, subprocesses of self-regulated learning (SRL), the focus of the present study, have also been found to correlate with student performance (Kizilcec, Pérez-Sanagustín, & Maldonado, 2017). To illustrate, one study involving interviews with learners of a health profession MOOC found that self-efficacy, task strategies, goal setting, and help-seeking of professionals were key ways that successful learners self-regulated in the course (Milligan & Littlejohn, 2016). Prior work in this area has yet to address why students who intend to complete their courses and who even pay for verified certificates still sometimes fail to complete them. Perhaps specific components of SRL are more powerful contributors to a student's likelihood to complete a MOOC than are some other components.

The present study investigated this issue and sought to understand the differences in SRL subprocesses between those who completed their course (i.e., MOOC completers) and those who did not (i.e., MOOC non-completers). Understanding key SRL differences can enable course designers and instructors to develop course structures that better support MOOC learners. In this study, students were surveyed in two

MOOCs offered by a public university located in the southwest region of the United States. The following two research questions guided this study:

> Research question 1: In what ways do MOOC completers differ from MOOC non-completers in regard to SRL?
>
> Research question 2: What SRL strategies contribute to student success in completing MOOCs?

Background

MOOC and Student Performance

The "massiveness" and "openness" of MOOCs are key characteristics that distinguish these courses from other online courses. Such openness fueled large student enrollments in the early MOOCs, with an initial average of more than 2,000 students per course (McAuley, Stewart, Siemens, & Cormier, 2010). However, median enrollments in MOOCs rapidly ballooned to over 40,000 participants from around the globe just a few years later (Jordan, 2014). More recent studies have set the median around 8,000 participants (Chuang & Ho, 2016). There have since been updates to enrollment policies on different MOOC platforms, such as requiring students to pay a fee to earn verified certificates of completion. Nonetheless, MOOC enrollments with the intent for such certificates still tend to be larger than traditional online courses, with estimates of at least 500 paying students in a typical MOOC course (Chuang & Ho, 2016).

MOOCs based on traditional university courses are often referred to as xMOOCs (eXtended massive open online courses). Such courses are often versions of traditional courses that have been adapted to accommodate large enrollments, as well as the great diversity of students' educational and cultural backgrounds. Along with grades and course withdrawals, completion of courses is commonly used as a proxy in online education for measuring student performance (Picciano, 2002). This has been the case in MOOC research as well, though some experts caution that the characteristic openness of MOOCs adds some complexity to this issue (DeBoer et al., 2014).

Reich (2014) suggested that MOOC completion should be viewed from the context of student intent. He found that students who registered with the intention to complete their MOOCs had higher completion rates than their peers who registered with the intention to just browse or audit the MOOC in which they are enrolled. Accordingly, the use of MOOC completion rates seems to be more fitting when used to assess the performance of verified certificate students (or Signature Track on the Coursera platform), as enrollment in such programs has been found to be a dominant factor in motivating students to complete their courses (Watted & Barak, 2018).

MOOCs and Self-Regulated Learning

Limitations in being able to provide personalized course delivery and individual feedback have led many MOOC designers to opt for more behaviorist pedagogical approaches in which video lectures and computer-graded assignments are primarily used (Knox, 2013). Learners are expected to self-manage much of their

study skills, such as planning their learning goals, adjusting their study environments, and identifying sources that could help with assignments (Littlejohn, Hood, Milligan, & Mustain, 2016). Such study skills are often touted as essential SRL subprocesses and are typically the hallmarks of successful learners (Zimmerman, 2013).

SRL is a construct that consists of multiple elements involved with planning, organizing, self-monitoring, and self-evaluating so that students are "metacognitively, motivationally, and behaviorally active participants in their own learning process" (Zimmerman, 1989, p. 329). Zimmerman (2013) identified 18 subprocesses involved in SRL: (a) goal setting, (b) time management, (c) self-efficacy, (d) outcome expectation, (e) task interest/value, (f) goal orientation, (g) self-instruction, (h) imagery, (i) attention focusing, (j) task strategies, (k) environmental structuring, (l) help-seeking, (m) metacognitive monitoring, (n) self-recording, (o) self-evaluation, (p) causal attribution, (q) self-satisfaction/affect, and (r) adaptive/defensive. Research findings consistently demonstrate that students with higher SRL levels achieve better academic results than those with lower SRL levels, both in face-to-face (e.g., Pintrich, 2004) and online (e.g., Broadbent & Poon, 2015) learning environments.

Since SRL behaviors tend to be context-dependent (Schunk, 2001), investigating SRL in MOOCs could shed light on how such strategies might impact student performance in the massive, open, online context. Initial studies thus far have found marked differences between MOOC students with high and low SRL scores, respectively, particularly in areas of motivation and goals for participation (Littlejohn et al., 2016). More recently, a study by Tsai, Lin, Hong, and Tai (2018) identified learner metacognition as a significant contributor to learner continuance in a MOOC. Similarly, learner volitional control when they act purposefully regarding time management has been found to support successful MOOC completion (Kizilcec et al., 2017).

Successful MOOC students are often skilled at connecting with others when they need help; for instance, asking questions of classmates via course discussion forums (Gillani & Eynon, 2014) as well as from others outside of the course who may have relevant skills or experiences (Breslow et al., 2013). Setting goals and other strategic planning activities have also been found to support higher student performance (Kizilcec et al., 2017). Such studies demonstrate the connection between SRL and student performance in general; however, further investigation into the impact of specific SRL subprocesses on MOOC completion is needed.

Method

Data Sources

Study participants were drawn from registered students of two MOOCs developed by a public university in the Southwestern United States and offered on the Coursera platform. The MOOCs were part of the Powerful Tools for Teaching and Learning teacher professional development series that addressed educational technology topics. *Digital Storytelling (DS-MOOC)* focused on the principles and educational uses of digital storytelling; the practice of telling stories using computer-based tools (Robin, 2008). In

contrast, *Web 2.0 Tools (Web 2.0-MOOC)* addressed a variety of Web-based tools that support classroom communication, collaboration, and creativity. Both courses were five weeks in length and were offered in English. Students were expected to commit about three to four hours each week for each course to work through the materials and activities. Regarding quality, the courses have received high student ratings, averaging 4.5 (*DS-MOOC*) and 4.6 (*Web 2.0-MOOC*) out of 5 stars prior to this study. In both courses, students earned certificates of completion if they achieved at least a 70% average for the course activities and assignments.

Participants

Out of the 65,227 registrations in the two courses, potential participants for this study were selected as those that completed at least one graded assignment in either course and were at least 18 years old at the time of the post-course survey. After removing duplications of students who participated in both courses, 5,935 students met the inclusion criteria. Of these, 643 completed the survey (10.8%).

Participants self-identified as either MOOC completer or MOOC non-completer through a specific survey item. There were 315 (49.0%) MOOC completers and 328 (51.0%) MOOC non-completers (see Table 1). Most (87.3%) participants in these two MOOCs reported that they did not enroll in the Signature Track program for these courses. Participant ages at the time of the survey ranged from 19 to 84 years old, with an average of 45.75 years (SD = 12.23). There were more females (68.4%) than males (29.4%), with 2.2% of the respondents not indicating gender. Interestingly, most participants were highly educated, with 92.8% having college degrees.

Table 1

Respondents' Demographic Information

Variable	Number	Percent (%)
MOOC completion status		
Did not complete	328	51.0
Completed	315	49.0
Signature Track enrollment		
Not Enrolled	561	87.3
Enrolled	82	12.7
Gender		
Male	189	29.4
Female	440	68.4
Prefer not to say	14	2.2
Age		
20 or younger	3	.5
21–25	16	2.5
26–30	61	9.5
31–35	80	12.4
36–40	74	11.5
41–45	88	13.7
46–50	83	12.9
51–55	81	12.6
56–60	77	12.0
61–65	47	7.3
66–70	21	3.3
71–75	9	1.4
80 or older	3	.5
Highest degree or level of education completed		
Some high school, no diploma	2	.3
High school graduate, diploma or equivalent (e.g., GED)	12	1.9
Some college credit, no degree	10	1.6
Trade/technical/vocational training	8	1.2
Associate degree	14	2.2
Bachelor's degree	147	22.9
Master's degree	318	49.5
Professional degree	54	8.4
Doctorate degree	78	12.1

Instruments

The data this study were collected using a survey comprised of the Online Self-Regulated Learning Questionnaire (OSLQ) and an additional open-response item. Six OSLQ subscales, associated with each of the SRL subprocesses (Barnard, Lan, To, Paton, & Lai, 2009), were used: goal setting, environmental structuring, task strategies, time management, help-seeking, and self-evaluation. The OSLQ is well-validated and has been found to be a reliable instrument for measuring student SRL levels in online learning environments (Barnard et al., 2009; Chang et al. 2015). The reliability of the OSLQ was calculated using Cronbach's alpha coefficient. The composite coefficient (α = .88) demonstrated that the internal consistency of the scale was acceptable. The Cronbach alphas by subscale ranged from .65 to .84, revealing satisfactory discriminating power (see Table 2).

Table 2

Cronbach's Alpha for Each Subscale

Dependent variable	α
Goal setting	.75
Environmental structuring	.84
Task strategies	.65
Time management	.67
Help-seeking	.78
Self-evaluation	.75

In the OSLQ portion of the survey, there were 24 closed-response items, with Likert responses ranging from 1 (strongly disagree) to 5 (strongly agree). The complete instrument is available online (http://digitalstorytelling.coe.uh.edu/MOOCSurvey/OSLQ.pdf). One item, TM3, was slightly modified for this study, from "I prepare my questions before joining in [the] chat room and discussion" to "I prepare my questions before joining in discussion forums." Scoring the OSLQ involved totaling responses across the items, with higher totals indicating higher levels of learner self-regulation. An open-ended item was added at the end of the survey, asking respondents to describe factors that they believed contributed to their MOOC completion (for MOOC completers) or to their not completing their MOOC (for MOOC non-completers).

Data Collection Procedures

A study invitation e-mail was sent to each potential participant that introduced the researchers, described the study purpose and requirements to participate, offered an incentive for study participation, and provided the online survey link. The survey link was unique for each e-mail so that the survey responses could be connected to students' grade reports. The data collection process took place over a two-week period in February 2017. An e-mail reminder was sent one week after the initial invitation e-mail to those who did not respond to the first invitation.

Analyses

Data from responses to the OSLQ items were analyzed using a one-way multivariate analysis of variance (MANOVA) to explore possible differences in SRL strategies between MOOC completers and MOOC non-completers. Responses to the open-ended item were analyzed in three phases using a directed qualitative content analysis approach (Elo et al., 2014; Hsieh & Shannon, 2005). In the first phase, an initial codebook was created, based on the 18 SRL subprocesses (Zimmerman, 2013). In the codebook, codes were defined, corresponding SRL phases and areas were identified, and examples from study data were noted. Code definitions were further expanded and refined as data was coded and recoded. The complete definitions are available online (http://digitalstorytelling.coe.uh.edu/MOOCSurvey/definitions.pdf).

In the second phase, the 603 submitted responses were coded by the first and second authors, with one or more codes applied to each response. For example, the response "I enrolled in the courses because I was interested in the topic. Generally, once I start something, I complete it" (Respondent 466) was coded as task interest/value and goal setting. The authors jointly coded 40 responses initially to align their interpretation of the codes and code definitions. They then individually coded the remaining 563 responses. Individual coding was compared, and agreement was observed in 516 of the individually-coded responses (91.65% inter-rater agreement). The researchers then met, discussed the codes, and resolved all differences until 100% agreement was reached. In the third phase, descriptive statistics were calculated for MOOC completers and MOOC non-completers from the coding, and leading areas were identified.

Results

Research Question 1: In What Ways do MOOC Completers Differ From MOOC Non-Completers in Regard to SRL?

The preliminary investigation detected a few univariate and multivariate outliers on the goal setting and the environmental structuring subscales, as assessed by boxplot and Mahalanobis distance ($p < .001$), respectively. A comparison of the results of a one-way MANOVA with and without the outliers showed that the goal setting subscale had significant results in both situations, while the environmental structuring subscale had a significant result when the outliers were included. To reduce bias in data analysis, a 5% trimming was applied, which removed the top and bottom 5% of the data in the two variables (Field, 2018).

Subscale distribution curves revealed slight skewness and kurtosis for some of the dependent variables. However, since MANOVA is considered to be fairly robust to deviations from normality, it was decided to proceed with the data analysis. The scatterplot matrices provided evidence for meeting the assumption of linear relationships among the independent variables. There was no multicollinearity, as assessed by Spearman's rho; the weakest correlation was between environmental structuring and self-evaluation ($r_s = .166$, $p < .001$), while the strongest correlation was between help-seeking and self-evaluation ($r_s = .689$, $p < .001$).

The assumption of homogeneity of variances was met for each of the dependent variables, as assessed by Levene's test of equality of variances ($p < .05$). Pillai's Trace showed that there was a statistically significant

difference between the MOOC completer and MOOC non-completer groups in regard to SRL, F (6, 570) = 4.875, p = .000; partial η2 = .049; observed power = .992. Further tests of between-subject effects (see Table 3) found significant differences between MOOC completers and MOOC non-completers, (F (1, 575) = 22.844, p = .000; partial η2 = .038; observed power = .998) in the Goal Setting subscale. The other five subscales did not show a significant difference between the MOOC Completer and MOOC Non-completer (p > .05).

Table 3

Results of Tests of Between-Subjects Effects

Dependent variable	Mean square	F	Sig.	Partial eta squared	Observed power
Goal setting	11.856	22.844	0.000	0.038	0.998
Environmental structuring	0.450	1.207	0.272	0.002	0.195
Task strategies	0.124	0.185	0.667	0.000	0.071
Time management	0.030	0.033	0.855	0.000	0.054
Help-Seeking	0.690	0.796	0.373	0.001	0.145
Self-Evaluation	0.734	1.033	0.310	0.002	0.174

Note. Hypothesis *df* = 1, and error *df* = 575.

Following the findings from the MANOVA analysis, multiple independent t-tests were run on each of the five items in the goal setting subscale (GS1-GS5) to identify those that generated different responses between MOOC completers and MOOC non-completers. The significance level was corrected with Bonferroni correction to reduce the risk of a type I error (Field, 2018), and the corrected p-value was 0.01. The items that showed a significant difference between the two groups were GS1, GS2, GS3, and GS4 (p < .01). See Table 4 for the complete results.

Table 4

Results of Multiple T-Tests for the Items in Goal Setting and Environment Structuring

		Levene's test		T-test for equality of means						
									95% CI of the difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference	Lower	Upper
GS1	Equal variances assumed	1.583	.209	-3.060	576	.002	-.228	.074	-.374	-.081
	Equal variances not assumed			-3.061	575.768	.002	-.228	.074	-.374	-.082
GS2	Equal variances assumed	9.783	.002	-3.046	577	.002	-.251	.082	-.413	-.089
	Equal variances not assumed			-3.050	565.440	.002	-.251	.082	-.413	-.089
GS3	Equal variances assumed	1.540	.215	-5.331	577	.000	-.410	.077	-.561	-.259
	Equal variances not assumed			-5.338	566.789	.000	-.410	.077	-.560	-.259
GS4	Equal variances assumed	8.013	.005	-4.202	577	.000	-.341	.081	-.500	-.181
	Equal variances not assumed			-4.206	570.411	.000	-.341	.081	-.500	-.182
GS5	Equal variances assumed	.017	.897	-2.004	576	.046	-.217	.108	-.429	-.004
	Equal variances not assumed			-2.003	575.260	.046	-.217	.108	-.429	-.004

Note. 0.01 is the criterion for significance (as calculated by dividing 0.05 with 5 using the Bonferroni correction method).

Research Question 2: What SRL Strategies Contribute to Student Success in Completing MOOCs?

Because research question 2 relates to the SRL strategies that students identified as contributing to their successful MOOC completion, the reported results and associated discussion section of this article will focus mainly on the principal themes from the analysis of MOOC completer responses. In the coding of the open-ended item, there were 464 codes applied to the 306 MOOC completer responses. Comparisons of codes are provided in Table 5.

With 175 (37.72%) entries, task interest/value was most frequently mentioned as a critical contributor to their course completion. The causal attribution subprocess was the second leading theme from the responses (14.66% of entries). Another theme was time management, accounting for 12.72% of the entries

such as strategies related to allocating study time, creating a study schedule, and ensuring time availability. Self-efficacy was coded in 11.42% of the entries, including any mentions of motivation, self-motivation, self-discipline, commitment, and will. The final leading theme that emerged was goal orientation (5.82% of entries). Most of the statements were related to learner desire to earn certificates of completion and commendations from their peers or organizations.

Table 5

The Frequency of SRL Codes for MOOC Completers

Subprocess	Frequency	%
Task interest/value	175	37.72
Causal attribution	68	14.66
Time management	59	12.72
Self-efficacy	53	11.42
Goal orientation	27	5.82
Goal setting	20	4.31
Help-seeking	18	3.88
Outcome expectation	14	3.02
Self-instruction	12	2.59
Self-satisfaction/affect	9	1.94
Environmental structuring	3	0.65
Task strategies	3	0.65
Self-evaluation	2	0.43
Attention focusing	1	0.22
Adaptive/defensive	0	0.00
Imagery	0	0.00
Metacognitive monitoring	0	0.00
Self-recording	0	0.00
Total	464	100

Discussion

Certainly, SRL strategies are used by every learner to some extent whether consciously or unconsciously. However, what can set high performing students apart from low performers is their awareness of SRL and the use of these strategies in their learning process (Zimmerman, 2013). Analysis from the OSLQ data showed that MOOC completers reported significantly higher use of the goal setting SRL subprocess than did MOOC non-completers. MOOC completers scored higher in particular aspects of goal setting, such as establishing standards for the assignments, setting short-term goals (i.e., daily or weekly) and long-term goals (i.e., monthly or for the semester), and self-monitoring to maintain what they perceived as a high standard for learning in their MOOCs. This finding is consistent with prior studies that found goal setting to be a critical SRL subprocess and a significant predictor of learning success in MOOCs (Kizilcec et al., 2017; Littlejohn et al., 2016).

The statistical analyses also showed that MOOC completers did not differ statistically from MOOC non-completers on the other five subprocesses. A possible explanation for this could relate to how the MOOCs were structured. In both MOOCs, the tasks were very procedural, and participants were given step-by-step instructions to complete the assignments. Also, the assignments required students to self-reflect, provide reviews to other students' works, and actively participate in the discussion forums. Having such aspects of the courses structured for learners could have minimized the need for them to self-initiate the strategies.

It should be noted, though, that this finding does not imply that goal setting in isolation will directly result in learner performance gains. Qualitative content analysis of the open-ended responses submitted by MOOC Completers also identified five key SRL subprocesses of task interest/value, causal attribution, time management, self-efficacy, and goal orientation. It was found that MOOC completers often applied multiple SRL subprocesses to improve their learning experience in the MOOC environment. These five SRL subprocesses will each be further discussed in turn.

The task interest/value subprocess relates to why the respondents registered for the MOOCs in the first place. This subprocess, which is composed of several main factors including importance, interest, and relevance or usefulness of the skills (Eccles et al., 1983), is closely related to goal setting. Learners in this study who considered that the topics were important or relevant to their careers were more likely to put forth their best efforts to achieve their learning goals, as illustrated by Respondent 231's response, "[The] MOOC was important to me because of the content, which is related to my occupation." Learners who consider the topics relevant to their daily lives or feel that the learning tasks are interesting will typically display higher learning performance (Pintrich, 2004).

The causal attribution subprocess refers to student's perception of the causes of their performance during a learning process (Zimmerman, 2013). Learners may perceive better learning performance when the course design is congruent with their learning preferences. For instance, Respondent 502 stated that "the interface, content design and the flow of content made it interesting and relevant to what we needed to know." Similar findings in relation to course design and course completion are reported in Hone and El Said (2016).

Though no significant difference was evident between MOOC completers and MOOC non-completers on the OSLQ for the time management subprocess, it emerged as a theme from the open-ended responses. For example, Respondent 209 noted that "having a clear idea of what the required tasks were, and setting aside time to get them done" are the key contributors to the learner's MOOC completion. Broadbent and Poon (2015) similarly had mixed findings in their systematic review, wherein five of the seven studies they analyzed found a significant positive correlation between time management and student performance in online learning and two had no relationship.

Self-Efficacy, the subprocess that refers to learner belief in his or her ability to complete a learning task, is also related to goal setting (Bandura, 1997). Respondent 595 illustrated the relationship well:

> The fact that I had over one year of experience in online learning probably helped tremendously. Aside from earning my Master's degree online, I am also a doctoral candidate for EdD, Curriculum and Instruction, and have specialized in distance education, therefore giving me a huge advantage over other learners enrolled in either of these MOOCs.

Learners with positive prior experiences may tend to have higher self-appraisals of their abilities and higher levels of self-efficacy. These learners are generally committed and motivated to complete the goals that they have set. The theme of higher self-efficacy among MOOC completers in this study is congruent with other MOOC studies (e.g., Barak, Watted, & Haick, 2016; Wang & Baker, 2018).

The goal orientation subprocess refers to learner orientation preferences in achieving the goals that they have set. Dweck (1986) suggested that this subprocess has two dimensions: (a) a learning dimension that desires to improve one's competence by mastering new skills, and (b) a performance dimension that seeks to demonstrate one's competence to others to gain favorable judgments or avoid negative judgments from others. In MOOCs, orienting to goals could involve activities such as working toward obtaining course certificates of completion in order to earn recognition or career advancement, such as described by Respondent 198 who said that "our workplace was encouraging us to do a MOOC related to education and gave a monetary incentive for it." The emergence of goal orientation as a key theme in the qualitative data concurs with a recent study by Wang and Baker (2018).

Implications for Practice

The findings from this study present several implications for MOOC instructors who create and develop MOOCs, and for MOOC platform providers that partner with universities and other organizations. The results from this study showed that the goal setting subprocess was significant to MOOC learner success. Nevertheless, the sequence of actions involved from setting a learning goal to achieving it is complex, and involves other SRL subprocesses as well.

Instructors and instructional designers may want to consider elements of course design that could strategically help students in achieving their learning goals. Setting learning goals could be supported, for example, by providing a course outline detailing the course description, assessment overview, and the expected time commitments for course activities prior to the beginning of the course. The course outline

could help learners determine the importance of the course and develop better strategies for achieving their learning goals if they decide to enroll in the MOOC. The time commitment details could be reinforced at course launch by providing time estimates for the activities scheduled for each week of the course. These time estimates can be generated from user data gathered during the first course offering week and from following implementations of the course; therefore, time estimates can be refined based on calculated averages of the actual time prior students spent on the course activities (Nawrot & Doucet, 2014).

Self-guided pre-assessment prompts regarding student readiness to learn in the MOOC environment could also be provided in the form of a course readiness checklist before students begin a course. Such a checklist would provide potential online learners with pre-course prompting and feedback intended to help them identify areas in their study habits and learning spaces in which they may need to make modifications or intentionally address in order to be successful in the MOOC format. This type of pre-assessment has been used in online courses for over a decade (e.g., the Online Readiness Assessment; Williams, n.d.), and it could be a worthwhile strategy to apply to the MOOC learning environment as well. Pre-assessment items related to learner readiness for MOOC-formatted instruction would prompt students to consider areas such as learning preferences, study skills, as well as technology skills and access. By working through the pre-assessment prior to taking a MOOC, students would consider these and other areas when planning their course-related learning goals. Further, pre-assessment responses could generate automated feedback such that students scoring lower in familiarity with course topics could be directed to background material that would address their prior knowledge gaps. Building in such support for students can be worthwhile, as students who have such sufficient pre-course topic familiarity tend to have higher levels of confidence and MOOC engagement (Littlejohn et al., 2016).

Another course design recommendation stemming from this study is to inform learners about how assignments will be evaluated. For open-ended projects, such as creating digital storytelling videos, examples of completed assignments could also be provided to illustrate expectations regarding aspects of breadth, depth, and quality. Having this information may help students better understand what is expected from them for these assignments and enable them to set short-term goals and plan their next steps to achieve those goals.

In addition to providing information about course details and expectations, and guiding students toward setting goals, incorporating reminders into the MOOC learning platform can spur students to stay engaged in their learning (Cleary, 2018). Reminders could take the form of quick tips that pop-up each time a student logs into the course to provide suggestions and advice related to study-related goals (see Figure 1). Reminders could also be sent through notifications, messages, and e-mail.

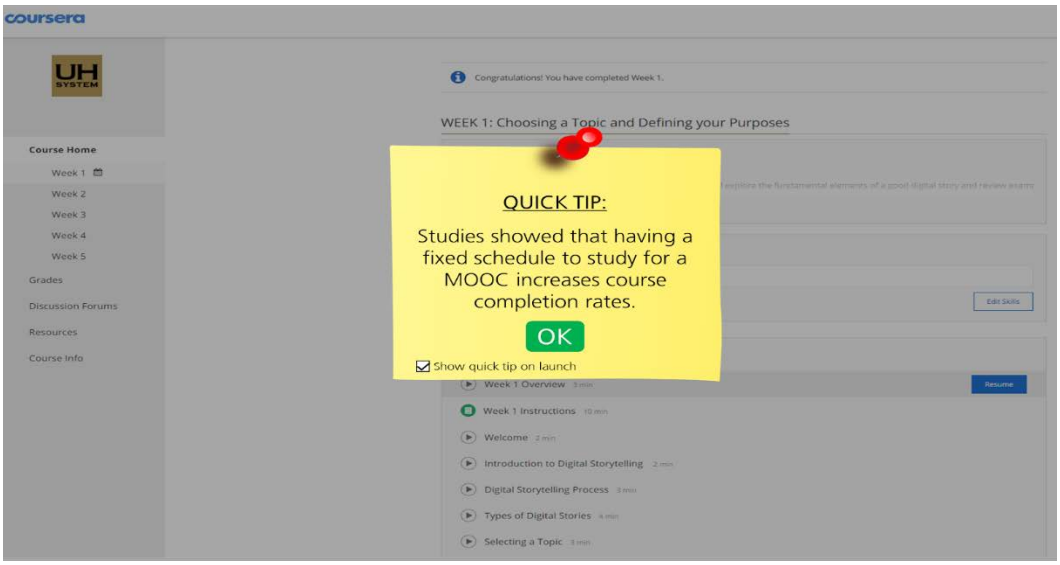

Figure 1. An illustration of a quick tip pop-up providing a suggestion related to study goals.

Consideration can also be given to how new MOOC learners may experience challenges due to unfamiliarity with nuances of the MOOC learning platform. While platforms typically offer help centers that provide answers to technical platform questions, they sometimes require learners to navigate away from the course sites. Furthermore, help center information can be overwhelming, as it aims to provide a knowledge base for all users on the platform. Adding a New Users tab next to the course content could support new learners within the course site (see Figure 2). In addition to information on the technical aspects of the MOOC platform, the tab could also provide answers to frequently asked questions, as well as recommendations regarding study strategies from instructors and previously successful learners.

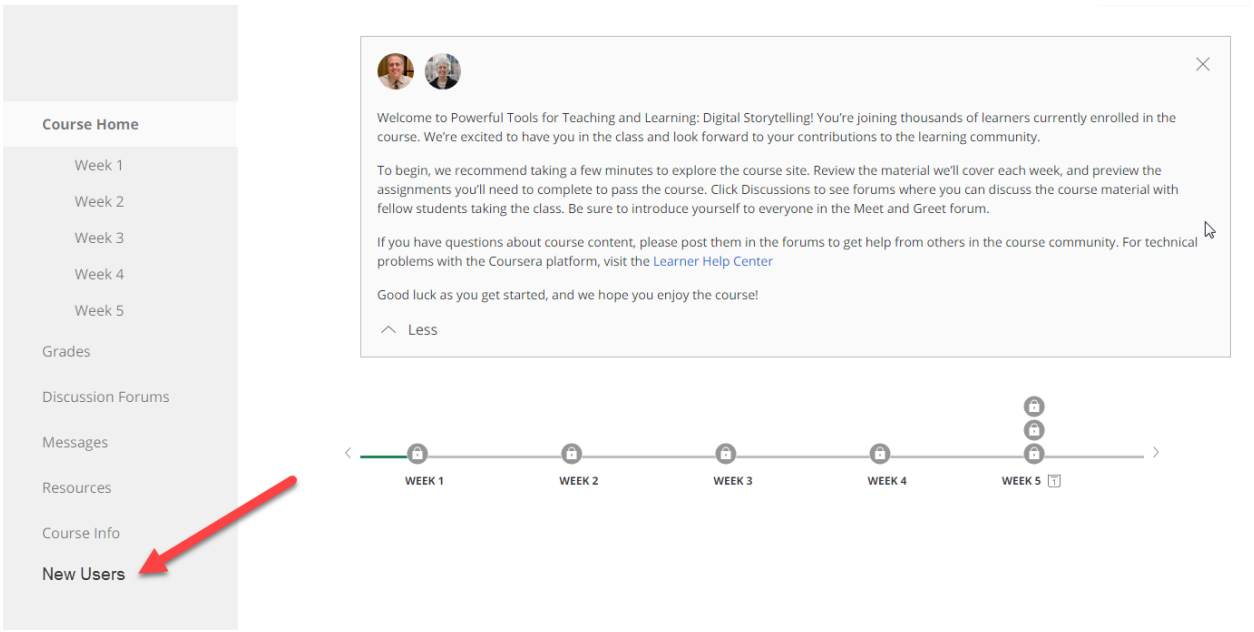

Figure 2. Adding a new users tab to help new students get adjusted to the MOOC.

Limitations and Future Directions

While this study offers insights into SRL subprocesses that can contribute to MOOC completion, there are some limitations in the generalizability of the findings. Participants from this study self-identified as MOOC completers. Thus, their perceptions concerning course completion may not reflect whether they actually received certificates of completion. Future studies could involve participant recruitment based on course activity data to identify MOOC completers. Participants in this study were from two MOOCs on educational technology topics. Hence, further research is needed to determine if the themes that emerged in this study are characteristic of MOOC completion in other subject areas. Replicating this study with varied student populations could contribute to a greater understanding of the observed themes.

Course characteristics, such as length and assignment difficulty, may also have affected student performance in this study. Future research could investigate how students engage in SRL in courses of different lengths and difficulty levels, as well as courses offered through various course platforms. The participants in the study tended to be highly educated, which is typical in MOOCs (Hansen & Reich, 2015). However, this characteristic may limit the generalization of the findings for MOOCs that target learners with limited educational backgrounds.

The two MOOCs in this study were offered through the Coursera platform. As with any learning management system or learning delivery mechanism, platform characteristics could have impacted learner perceptions regarding course design. The study also utilized learner self-report data that relies on the participants' views and recollections of their applications of SRL subprocesses. Future research could involve observations and gathering evidence of learner applications of SRL subprocesses by MOOC completers.

Since the OSLQ was not initially developed for the MOOC setting, further studies are needed to explore the validity and reliability of the OSLQ for assessing SRL in a MOOC. There is also an opportunity for the development of MOOC-oriented SRL instruments that could identify additional SRL subprocesses specific to learning in MOOCs. MOOC-specific instruments could enrich understanding of how SRL contributes to MOOC completion and provide insights into how SRL is applicable in MOOC learning environments.

Conclusion

Prior research has identified the importance of SRL in student learning. The present study extends this research to highlight the role of goal setting, specifically within the context of MOOCs. It further illuminates particular aspects of this SRL subprocess that course instructors and designers could target to support learners. Goal setting is complex and can involve other SRL subprocesses, such as task interest/value, causal attribution, time management, self-efficacy, and goal orientation. By having early access to information about course content and expectations, learners can proactively decide whether the course topics and activities align with their interests and priorities. Time commitment details and pre-assessment feedback can be used to inform and prompt students to set specific, personalized short-term and long-term course goals. Setting such goals can position MOOC students for better performance and help them to identify, work toward, and ultimately achieve their learning goals.

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Case Study as a Research Method for Analyzing MOOCs: Presence and Characteristics of Those Case Studies in the Main Scientific Databases

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Abstract

Educational research is one of the many fields of knowledge that frequently use case studies as a research method, particularly when applying an interpretive approach. Based on literature reviews and a systematic analysis of current scientific literature, this paper examines the prevalence and characteristics of the case study as a methodology for research on MOOCs. Ninety-two documents were selected from the search results returned by two of the most prestigious scientific databases: Web of Science (WOS) and SCOPUS. Findings showed that (a) even when searching solely for case studies, quantitative research paradigms were more prevalent than interpretive approaches; (b) geographical distribution of these studies was partially biased; (c) case studies were less prevalent in these databases than other empirical investigations on MOOCs; (d) the data collection and data analysis methods most frequently used in the case studies were more aligned with a quantitative approach; and (e) there is still very little instructor-focused research using this methodology. In the light of these findings and their discussion, future directions for research using case study methodology are proposed, given the potential of this method to illustrate certain issues for which other approaches have proved inadequate or insufficient.

Keywords: MOOC, case study, literature review, research methods, literature analysis

Introduction and Literature Review

The study of MOOCs is very diverse and encompasses many disciplines, fields of study, and ways of understanding research, both epistemologically and methodologically (Bates, 2014). Case study is an adequate, necessary method for certain research tasks in the field of social sciences (Flyvbjerg, 2006), and provided there is a large number of thoroughly executed case studies available, this approach contributes to better and more effective disciplines (Kuhn, 1987). The prevalence of this method in research on MOOCs (Kennedy, 2014; Raffaghelli, Cucchiara, & Persico, 2015) has varied over the past few years. Despite the amount of literature on case study research designs over the past 40 years (e.g., Bennett & Elman, 2008; Gomm, Hammersley, & Foster, 2000; Merriam, 2007; Mitchell, 1983; Simons, 2009; Stake, 1995; Yin, 2009), and attempts at defining a typology to assist researchers in structuring and analyzing such studies (Thomas, 2011), there is more than one way of understanding case studies. Historically, case studies in the literature were more associated with the interpretive paradigm. However, there are now some very diverse ways of understanding case study as a research methodology. Case studies can be conducted using quantitative/qualitative paradigms or mixed methods. Indeed, the vast amount of techniques and methods for data collection and analysis that can be used for such studies has led some authors to explicitly state that "the case study survives in a curious methodological limbo" (Gerring, 2004, p. 341).

A large number of reviews of the literature on MOOC research have been published, some of which focused on analyzing thematic aspects, while others dealt more with the methodological aspects. This study presents a brief review of these papers, with special emphasis on research using the case study as a methodology, and describes the data collection and data analysis methods used.

In the first review to be conducted in a systematic manner (Liyanagunawardena, Adams, & Williams, 2013), the selected literature was categorized into different areas of interest, and the authors proposed directions to guide future research. They also identified a number of thematic and methodological gaps in the scientific literature at that time, describing four challenges facing MOOC researchers and designers: (a) the need for all perspectives of MOOCs (e.g., learners, creators, teachers, institutions) to be explored; (b) cultural tensions among pedagogies, resources, and learning environments; (c) ethical aspects of using data generated by MOOCs; and (d) the implementation of effective learning strategies in order to achieve a successful balance between information overload and self-regulated learning within MOOCs. The authors classified 21 documents that included case study, most of which had used multiple methods, with surveys being the most common data collection method.

Ebben and Murphy (2014) postulated that MOOC research at the time of their writing could be divided into two phases, the first being more related to cMOOCs, engagement, and creativity, and the second focusing on xMOOCs, learning analytics, evaluation, and critical discourse on MOOCs. These authors presented the dominant theories, the directions followed by research up to that point, and the most prevalent topics dealt with in the literature. Methodological aspects and case studies were mentioned in their study but were not the main focus of their work. In the same year, Hew and Cheung (2014) conducted another review of the literature, focusing on the motivations and challenges relating to MOOC courses, namely diversity of topics, the perspective from which they were addressed (students or instructors), and main findings to date. Although the authors spoke briefly about the techniques used (p. 47), this was not either the main objective of their analysis.

Jacoby (2014) presented a review of the literature on the theory of disruptive innovation, reporting that prior research had been predominantly qualitative, particularly comprising case studies and narrative research (p. 74). This author also postulated the need for a broader methodological range to enhance data triangulation. In a similar review, Kennedy (2014) analyzed the limitations and gaps identified in previous research on MOOCs and put forward a number of recommendations for future research. Her review included only a short paragraph on methodological aspects (p. 7), noting the wide range of methodologies such as mixed methods, case studies, narrative inquiry, and comparative studies.

In a review of research proposals submitted to the MOOC Research Initiative (MRI), Gasevic, Kovanovix, Joksimoviv, and Siemens (2014) identified a number of topics that might be used as a framework for future research. They also analyzed the methodologies used in these proposals, reporting that 42.3% had used mixed methods, 33.3% quantitative methodology, and 24.4% a qualitative approach. However, subsequent analysis showed that this research does not distinguish between paradigm, and data collection and analysis methods (Veletsianos & Shepherdson, 2016).

Raffaghelli et al. (2015) was the first published review of MOOC literature with the sole objective of analyzing methodological approaches. The authors identified trends, gaps, and criticalities derived from methodological decisions taken by MOOC researchers in the period 2008 to 2014. They noted that this field of research was still in its infancy at the time of writing, and that much of the research they reviewed relied on theoretical-conceptual research and case studies, which they considered a preliminary step toward identifying methods to deal with large cohorts or large amounts of data. These authors postulated that research on MOOCs was still in the early stages of the full cycle of educational research (Gorard & Cook, 2007).

Veletsianos and Shepherdson (2015) carried out a further review on the concept of interdisciplinarity, as well as the ways in which research published in the years 2013 to 2015, which was more aligned with the concept of xMOOC, was more interdisciplinary in nature than research conducted during the first phase (Ebben & Murphy, 2014). Most of the work was carried out by researchers from the field of education or from computer science disciplines, whose contributions to the research on MOOCs are increasingly frequent. A subsequent review published the following year provided an overview of geographic distribution, publication outlets, methodologies used, and research strands followed in studies on MOOCs (Veletsianos & Shepherdson, 2016). The findings of this review showed that researchers had used quantitative rather than qualitative insight in their works, particularly surveys and automated methods. Further, the authors reported that qualitative research on MOOCs in the period analyzed was often basic, and very few studies had actually used methods traditionally associated with qualitative research.

Two reviews have been published in the past two years that focused wholly on methodological issues (Deng & Benckendorff, 2017; Zhu, Sari, & Lee, 2018). The first reported surveys as being the most widely used method for data collection, followed by interviews and log files, and that most of the articles examined had focused on the learner-student perspective (90.6%). The second review was based on 146 articles, of which 45.9% were quantitative, 35.6% had used mixed methods, and 18.5% were qualitative in nature; this review also reported surveys as being the most common method of data collection. Descriptive statistics, inferential analysis, and content analysis were the most usual data analysis methods found in this review.

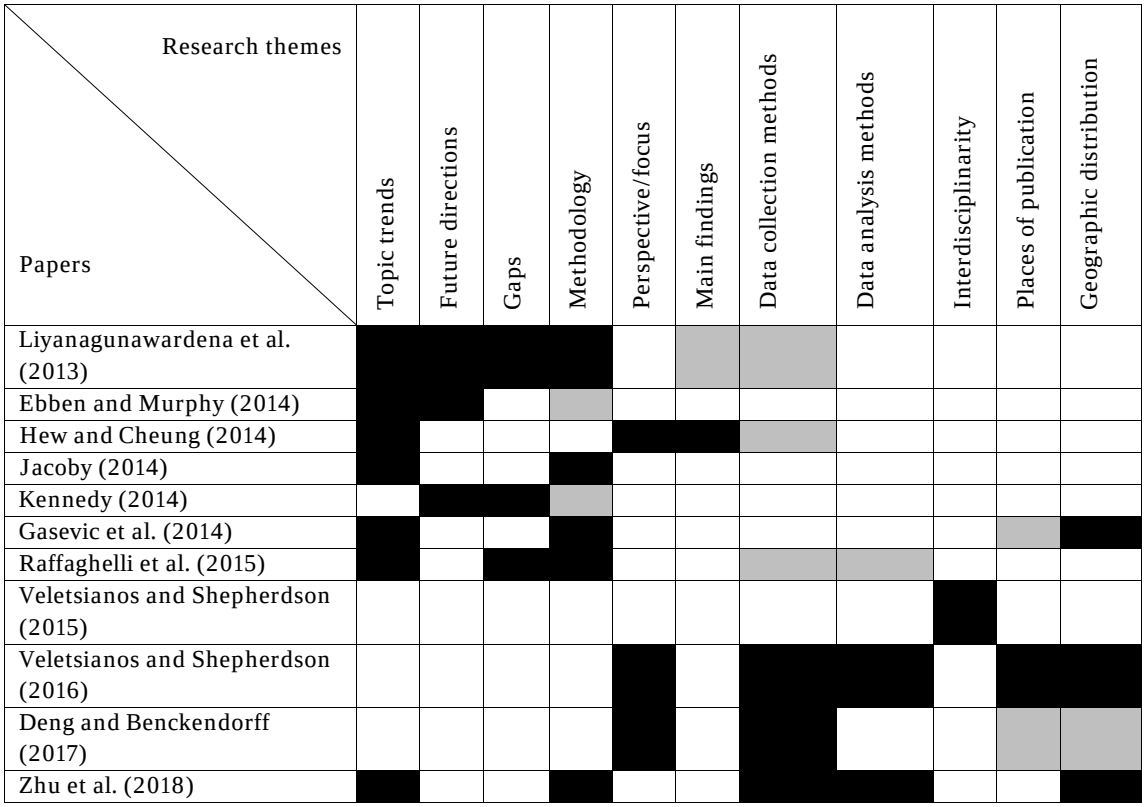

Figure 1. Reviews analyzed and their research objectives. Black indicates that a theme is the article's main focus and gray indicates a secondary focus.

The above-mentioned review of the literature (summarized in Figure 1) provided an overview of previous MOOC research. It showed that this field of study is expanding and constantly changing (Veletsianos & Shepherdson, 2016), and although in the early years it was mainly comprised of conceptual studies and case studies (Jacoby, 2014), its evolving nature brought forth a large number of macro-type empirical studies (e.g., big data, learning analytics) that were facilitated by the current availability of large datasets. However, no studies were found on the actual concept of case studies, or on the characteristics of case studies that are used to gain a deeper understanding of MOOC platforms. Generally, case studies in the field of social sciences have been understood as a methodology associated with qualitative, interpretive, or hermeneutic paradigms. Therefore, it is essential—and would enhance this field of study, and advance our understanding of the methodological aspects—that we examine how the scientific community is using case studies to explore online environments, and ascertain what paradigms/approaches and methods are used in these case studies, what is their research focus, and their prevalence in the main scientific databases.

Statement of Research Problem and Purpose

The main aim of this review was to gain a better understanding of the characteristics of case studies relating to MOOCs in the WOS and Scopus databases (i.e., the methodological approaches used, how they were implemented, and their focus). An in-depth review of extant literature in the major academic databases can provide information on the characteristics of the publications available in these peer-reviewed outlets, as well as what has already been done, what remains to be done, and what might be the possible direction for future research based on this methodology. The authors of this paper wished to contribute to one of the ideas for future research proposed by Veletsianos & Shepherdson (2016), namely that "future research endeavors in this area may focus on examining how particular

methodologies have shaped the field" (p. 215). Their research identified potential research gaps in the study of MOOCs and this paper confirms and extends that research to provide possible directions for future research using case studies.

In order to explore the presence of case study as a methodology for research on MOOCs, we posed the following research questions:

1. What methodological approaches did case studies on MOOCs follow?
2. What were the usual publication outlets for case studies on MOOCs: journals or conference proceedings? Which journals published the highest number of case studies on MOOCs?
3. Which case studies had the highest citation count, and how were the publications distributed over the years?
4. What data collection and data analysis methods were used in these case studies?
5. What was the main focus of these case studies?

Research Methodology

A systematic literature review was conducted based on an analysis of 92 documents of peer-reviewed literature indexed in the WOS and Scopus databases during the period January 2012 to June 2018. In order to answer the research questions, several methods were systematically followed to collect the extant literature in WOS and Scopus, and analyze the corpus of selected papers.

Data Collection

Searches of WOS and Scopus were performed in July 2018 using the keywords MOOC, MOOCs, massive open online courses, xMOOC, cMOOC, and these were interrelated with the keyword case study in the fields article, keywords, and abstract in the two databases (in WOS, the field is shown as topic). In order to analyze the returned results in greater detail, the following selection criteria were applied in order to selectively eliminate: (a) duplicated search results returned from separate databases; (b) documents that appeared to be case studies but were not, or had not used a case study as a part of their methodology; (c) documents in languages other than English or Spanish; (d) documents that were not proceedings or journal articles (in SCOPUS only journal articles were selected); and (e) any documents with a zero citation count. Application of these selection criteria brought forth a corpus of 92 papers.

The first step was to define the structure of a database to store the most relevant information from the documents analyzed. Records in the database were structured as shown in Table 1. Each of the records included objective information (e.g., title, author(s), keywords, year of publication, DOI/URL) as well as several other fields that were completed after reading and analyzing the full text of each document, including methodological approach, data collection methods, data analysis methods, and focus of the study.

Table 1

Database Structure

Field	Sub-field	Assigned values
Article ID	Title	Published title
	Type	Journal article or conference proceedings
	Source	Journal title/conference title
	Author/s	Name and surname
	Location	Country of author affiliation
	Publication date	Year
	Keywords	Published keywords
	DOI/URL	Online location
	Total citation count	Number published on WOS
	Mean citation count/year	Number published on WOS
Methodological approach/paradigm		Approach followed in the paper (e.g., qualitative, quantitative, mixed method)
Methods	Data collection	Method(s) used (e.g., surveys, interviews, forum participation, focus group)
	Data analysis	Method(s) used (e.g., descriptive statistics, content analysis, grounded theory, automated, software-guided analysis)
Paper focus		Focus element (e.g., learner(s), platform, instructor(s), pedagogical design, the community)

Data Classification and Analysis

The corpus was analyzed quantitatively and qualitatively. Quantitative analysis was used to classify the documents by year of publication, type of publication, country of author affiliation, citation count, and mean citation count per year. The documents were also analyzed qualitatively using open-coded content analysis, a technique that has been used previously in other literature review studies on MOOCs (Liyanagunawardena et al., 2013). First, one of the authors read each of the documents in order to identify the methodological approach, data collection methods, data analysis methods, and focus of the

paper. Subsequently, the other authors carried out a similar review, sharing their results with the first researcher. In case of discrepancies, researchers would re-read and examine the pertinent text together, and reach a joint decision.

The basic unit of analysis was a single selected paper; a constant comparison method was used for its classification and analysis. The first text was analyzed and coded by a researcher using emergent coding, and the topic category and methodological approaches were defined. The second text was analyzed in the same way and checked to determine whether it could be classified into the same category as the previous document; otherwise, a new category was created. The process was subsequently repeated until all documents had been read and analyzed. To eliminate the possibility of a document being classifiable in more than one category, the categories were thoroughly examined and verified by all authors to ensure that each category was exclusive and was not repeated in any way. The categories were shared and agreed to by all authors throughout the analysis process.

Results

The following tables show the results of the review of the corpus of collected papers for each of the research questions posed at the outset of this study.

Question One: What Methodological Approaches did Case Studies on MOOCs Follow?

On analyzing the individual documents, based on the previously described method, it was found that 30 documents had used a quantitative approach, and 26 a qualitative approach; 25 had used mixed methods, and 11 an unclear/not explicit approach.

Table 2

Methodological Approaches

Paradigm/approach	Number of documents
Quantitative	30
Qualitative	26
Mixed methods	25
Unclear/not explicit	11

Question Two: What Were the Usual Publication Outlets for Case Studies on MOOCs: Journals or Conference Proceedings? Which Journals Published the Highest Number of Case Studies on MOOCs?

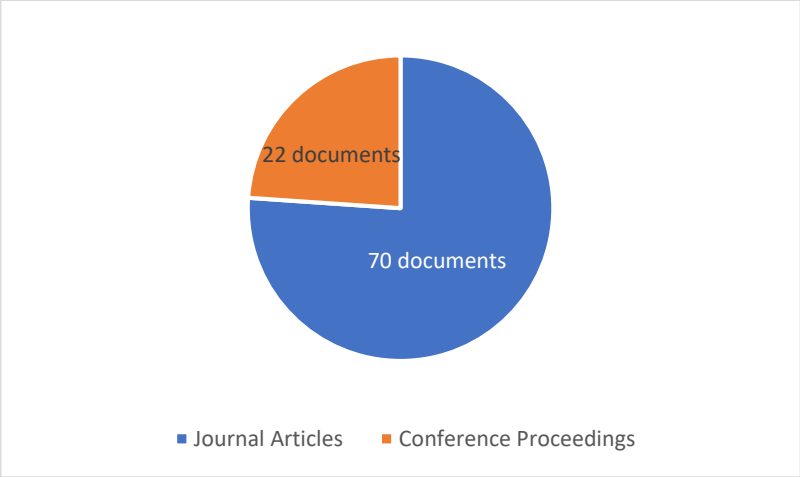

Figure 2. Type of document collected.

Of the 92 documents collected, 70 articles were from peer-reviewed journals and 22 were from conference proceedings. With regard to journal publications, 44 journals had each published one item; the remainder had published 2 or more documents, as shown in Table 3. The journal *International Review of Research in Open and Distributed Learning* (IRRODL) published 9 articles, the highest number of documents.

Table 3

Main Publication Outlets

Journal	Number of documents
International Review of Research in Open and Distributed Learning	9
Computers & Education	4
International Journal on e-Learning	3
British Journal of Educational Technology Open Learning	2
Computer Applications in Engineering Education	2
Journal of Computing in Higher Education	2
Open Learning	2
Open Praxis	2

Figure 3 illustrates the geographic distribution of those who authored the 92 articles. Overall, 30 documents had one or more authors from the United States of America (32.6% of the corpus), there were 17 documents with at least one author from Spain (18.5% of the corpus), 11 with at least one author from the United Kingdom (11.9%), six with at least one author from China, five with at least one author from Germany, and so forth. There are other 21 different author affiliations present in just one document, each accounting for 1.1% of the corpus. The most highly represented region in the corpus was Europe (42.4%), then North America (38%), followed by Asia (19.6%).

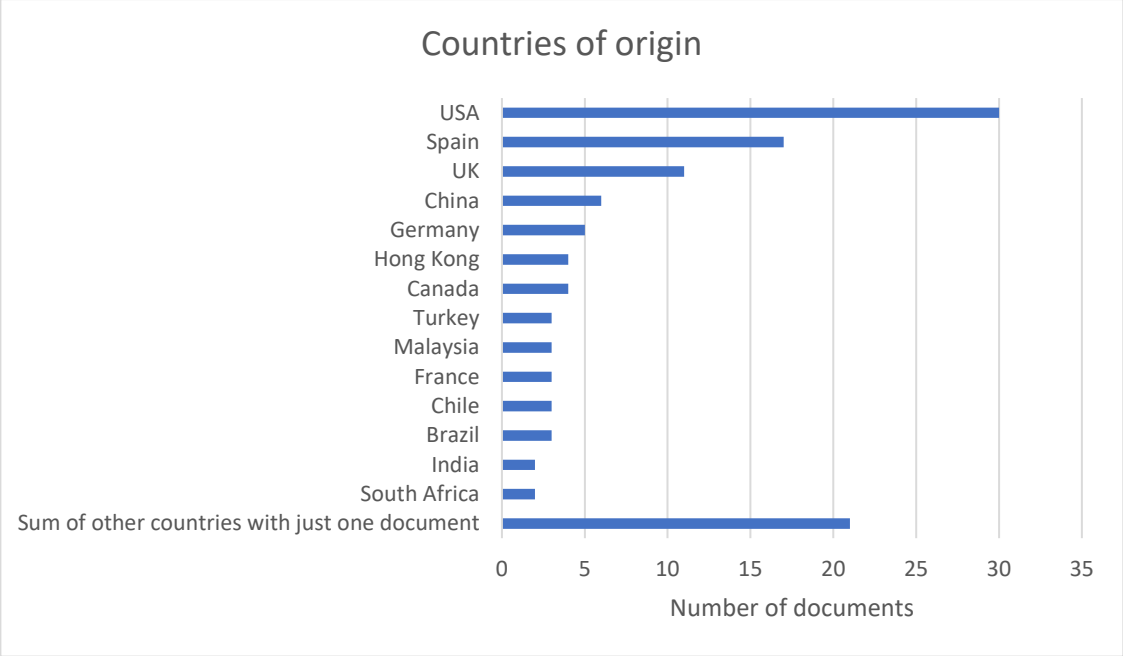

Figure 3. Authors' affiliation and number of documents.

Question Three: Which Case Studies Had the Highest Citation Count, and How Were the Publications Distributed Over the Years?

As Figure 4 shows, 37 of the documents analyzed were published in 2016 (40.2%), with 19 of the documents from the remaining years published in 2015 (20.6%), 15 in 2017 (16.3%), 12 in 2014 (13%), 5 in the first semester of 2018 (5.4%), 3 in 2013 (3.3%), and 1 in 2012 (1.1%).

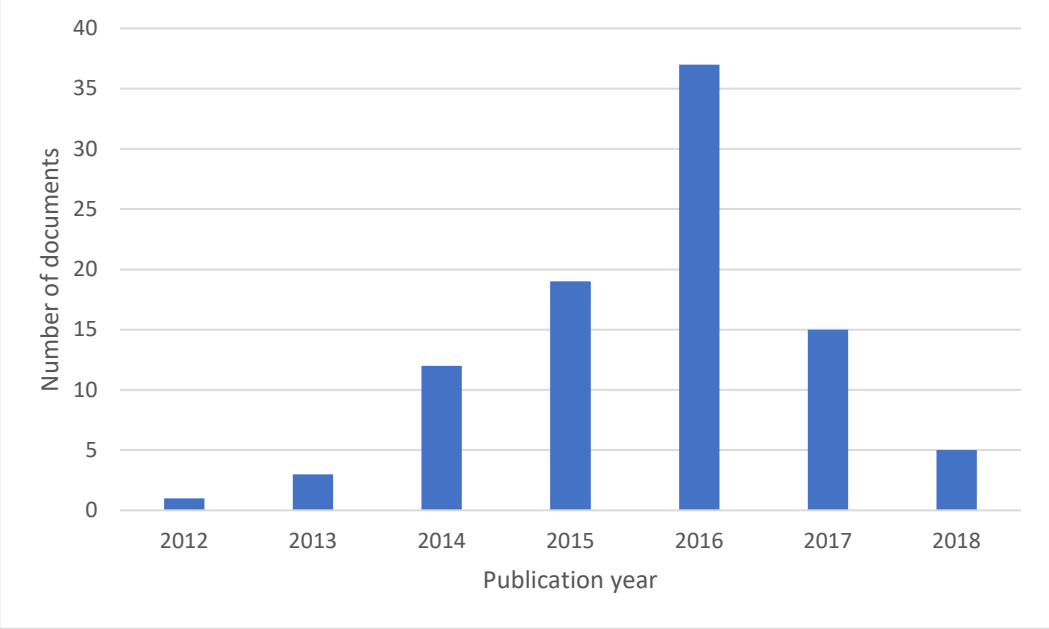

Figure 4. Documents by publication year.

Table 4 shows the highest citation counts in the Web of Science database (more than 10 citations) for the publications included in the corpus of this review; three of these were published in the *International Review of Research in Open and Distributed Learning*, three in *Computers & Education*, and three in other journals.

Table 4

Documents Most Frequently Cited

Year	Title	Publication outlet	Citations	Citations per year
2015	Will MOOCs transform learning and teaching in higher education? Engagement and course retention in online learning provision.	*British Journal of Educational Technology*	42	10.5
2013	Learning in a small, task-oriented, connectivist MOOC: Pedagogical issues and implications for higher education.	*International Review of Research in Open and Distributed Learning*	38	6.33
2015	Precise effectiveness strategy for analyzing the effectiveness of students with educational resources and activities in MOOCs.	*Computers in Human Behavior*	34	8.5
2016	Motivation to learn in massive open online courses: Examining	*Computers & Education*	33	11

	aspects of language and social engagement.			
2014	A social network perspective on peer-supported learning in MOOCs for educators.	*International Review of Research in Open and Distributed Learning*	21	4.2
2014	Case study: Using MOOCs for conventional college coursework.	*Distance Education*	21	4.2
2016	Learning outcomes of a MOOC designed for attitudinal change: A case study of an animal behaviour and welfare MOOC.	*Computers & Education*	19	6.33
2015	MOOC study group: Facilitation strategies, influential factors, and student perceived gains.	*Computers & Education*	15	3.75
2015	A usability evaluation of a blended MOOC environment: An experimental case study.	*International Review of Research in Open and Distributed Learning*	11	2.75

Note. Documents located as a result of search for MOOC + case study query.

A search was also performed of the WOS database using just the keyword MOOC, without the words case study. The search results list returned the three most-cited case studies in the corpus of our review (De Freitas, Morgan, & Gibson, 2015; Mackness, Waite, Roberts, & Lovegrove, 2013; Muñoz-Merino, Ruipérez-Valiente, Alario-Hoyos, Pérez-Sanagustín, & Delgado Kloos, 2015) in positions 26, 29, and 38 when sorted by citation count, which means that none of these case studies were among the 25 most-cited documents on MOOC literature.

Question Four: What Data Collection and Analysis Methods Were Used in These Case Studies?

An analysis of the main data collection methods showed that most of the studies reviewed had used one (41.4%) or two (35.7%) methods for collecting data. Three or more data collection methods were used in 22.9% of the documents.

Table 5

Data Collection Methods and Their Prevalence

Data collection methods	Number of documents using the method
Surveys and questionnaires	31
User datasets/user logs	26
Forum participation	17
Interviews	13
User productions (e.g., activities, PLEs)	12
Observations	10
Syllabus, guides, instructor documents	6
Social media (e.g., Twitter, Facebook)	6
Focus group	5
Video	2
Other methods	...

The most frequently used methods and techniques as shown in Table 5 are, in this order: surveys and questionnaires, user datasets or logs, and forum participation. Other collection methods not mentioned in the table were found in solely one document of the corpus (e.g., rubrics or email messages).

Table 6

Data Analysis Methods and Their Prevalence

Data analysis methods	Number of documents using the method
Statistical analysis (e.g., descriptive, inferential, correlational)	47
Content analysis	17
Grounded theory	11
Experimental or quasi-experimental	10
Thematic analysis	7
Automated analysis via software	6
Crosschecking between different analyses	5
Discourse analysis	5
Big data analysis/data mining	4
Ethnography	2
Data collection methods mentioned in one document only	...

Table 6 shows the data analysis methods used in the corpus documents, statistical analysis (various types) being the most frequent method used (47), followed by qualitative content analysis (17), grounded theory (11), and experimental or quasi-experimental analysis. Other methods used are shown in the table above: thematic analysis (7), software-assisted automated analysis (6), crosschecking

between different analyses (5), discourse analysis (5), big data analysis (4), and other methods mentioned in only one of the corpus documents.

Question Five: What Was the Main Focus of These Case Studies?

Six categories were established to describe the research reported in this corpus (see Table 7), using a categorization similar to that of Veletsianos and Shepherdson (2016). Most of the 92 MOOC case studies included in the sample were focused on learners/students (39) or the actual platform (28). Just 12 documents focused on pedagogical design, eight on instructors/teachers, three on the community, two on methodological design, and four on other elements. A small number of papers were included in two categories (4).

Table 7

Main Focus of the Case Studies

Focus	Number of documents
Learner	39
Platform/MOOC	28
Pedagogical design	12
Instructor	8
Community	3
Research methodology	2
Other	4

Learner-focused. All documents in which the key element was the figure of the learner were included in this category, regardless of the topic covered in the research. Other topics included learner expectations and perceptions (e.g., Cross & Whitelock, 2017), participation level (e.g., Veletsianos, 2017), roles and identities (e.g., Baxter & Haycock, 2014), user behaviors (e.g., Zhang & Yuan, 2016), or engagement/retention level (e.g., De Freitas et al., 2015).

Platform-focused. This category included papers focusing on the platform as the main research element. Papers covered topics such as platform usability (e.g., Yousef, Chatti, Schroeder, & Wosnitza, 2015), innovative tools (e.g., Fu, Zhao, Cui, & Qu, 2017), intelligent and adaptive systems (e.g., García-Peñalvo, Fidalgo-Blanco, & Sein-Echaluce, 2018), mediation and control (e.g., Nyoni, 2013), or the relationship between the pedagogical design and the platform design (e.g., Drake, O'Hara, & Seeman, 2015).

Pedagogical design-focused. Papers in this category focused on social and collaborative learning (e.g., Fidalgo-Blanco, Sein-Echaluce, & García-Peñalvo, 2016; Harp Ziegenfuss & Furse, 2016), connectivism and other theories (e.g., Anders, 2015), assessment and learning environments (e.g., Hills & Hughes, 2016), or social interactions between learners and instructors.

Instructor-focused. Papers in this category focused on the role of MOOC instructors (e.g., Haavind & Sistek-Chandler, 2015), instructor perspectives and experiences (e.g., Haavind & Sistek-Chandler, 2015), or the relationship between teaching and learning environments (e.g., Ramírez, Rivera, & García, 2015).

Community-focused. This category included a number of studies that focused on understanding the set of stakeholders in a MOOC, as a community (e.g., Grünewald et al., 2013, Jones, Stephens, Branch-Mueller, & De Groot, 2016).

Research methodology-focused. Papers in this category discussed improving data analysis and visualization (e.g., Pardos, Whyte, & Kao, 2016), or new data mining techniques (e.g., Maté, De Gregorio, Cámara, Trujillo, & Luján-Mora, 2016).

Other. This category included papers that could not be classified in any of the other categories because they concerned topics such as ethics and privacy (Jones & Regner, 2016), or plagiarism (Tsoni & Lionarakis, 2014).

Discussion

MOOC literature reviews published prior to this paper were examined. For the purpose of the present review, 92 publications that had used case study methodology for MOOC research were collected and analyzed. A dataset of MOOC-related case studies was created to facilitate identification of internal methodological approaches, publication outlet, prevalence in the databases, methods used for data collection and analysis, and the papers' research focus. Findings showed that despite being a methodology generally linked to more interpretive paradigms (Simons, 2009; Stake, 1995), almost 60% of the studies analyzed had used a quantitative approach (32.6%) or a mixed method (27.2%). The papers in the corpus analyzed in this study had been published in a wide range of journals and conference proceedings; some journals had published a greater number of studies than others. Findings also showed that the source of more than 80% of research using the case study method was Europe and North America. Further, it was observed that unless the keyword case study was included in the search query, the search results returned for the 25 most cited papers in the literature on MOOCs did not include any case studies. With regard to the data collection methods that appeared in these documents, the most notable methods were linked to quantitative paradigms such as surveys or the platform dataset; statistical analysis was the main data analysis method used. The focus of the case studies analyzed was essentially the students or the actual platform. Accordingly, these findings have a number of implications for future research on MOOCs using case study methodology, and for the state of the field as a whole.

Our Choices May be Limiting a Deeper Understanding of MOOCs

Coinciding with previous reviews of MOOC literature, this analysis suggests that researchers tended to choose a quantitative rather than a qualitative approach, even for case studies. This might suggest that more interpretive, hermeneutical, or qualitative research is needed. For example, as has also been noted in previous reviews (Veletsianos & Shepherdson, 2016), an in-depth analysis of the role of instructors in MOOC courses could serve to illustrate certain topics that do not seem to be much in evidence in the current literature. Qualitative case study would be a very useful methodological approach for such a purpose, thus providing some excellent possibilities for future research.

Certain Regions are Setting the Pace of Case Study Research on MOOCs

Author affiliation in more than 80% of the documents analyzed was either Europe or North America. This is in keeping with the findings from previous reviews researching geographical distribution, except

for a higher number of author affiliations from Spain, given that Spanish was included as a language in this review. Nonetheless, the results show that these databases analyzed may be favoring literature from certain regions, or otherwise limiting and failing to give visibility to the literature from other countries, which would possibly indicate a direction for future research, to analyze this geographical bias. Countries such as India or China, with a large presence in the MOOC community by the number of people enrolled in these courses, have little or no presence in the selected corpus.

Case Studies Tend to be Less Prevalent in the WOS and SCOPUS Databases Than Are Other Types of Empirical Studies

It was noted from the findings that the citation count for the case studies analyzed was somewhat lower than for other types of empirical studies. More than half of the documents returned in the search results had a zero-citation count. Further, the most frequently cited case study in the corpus ranked 26th in the listing. On analysis, only two of the ten most cited case studies had used a qualitative methodology, which raises the question of whether the research reported in the most highly ranked papers in these databases is perhaps quantitative rather than qualitative, even for case studies. Although a number of previous reviews in MOOC literature referred to the existence of case studies and their abundance (Raffaghelli et al., 2015), they were not always listed in the search results returned by the main databases. This highlights the higher presence of case studies in other databases (e.g., Google Scholar, ERIC, EBSCOhost) and a secondary role in WOS and SCOPUS.

Higher Prevalence of Quantitative Methods and Greater Diversity of Qualitative Methods

Surveys, questionnaires, and datasets were the most predominantly used methods, even in a large number of papers reporting so-called qualitative research. However, qualitative data collection methods, which were generally less prevalent, were found to be more diverse. Similar findings were obtained in regard to data analysis methods—a large number of the documents analyzed had used different types of statistical analysis (usually descriptive), and papers that had used methods more closely linked to the qualitative paradigm frequently used multiple techniques to analyze the data (e.g., content analysis, thematic analysis, discourse analysis, grounded theory). The database used for this study also showed a sharp increase in recent years in the use of automated analysis methods, and of research using big data or data mining techniques for data analysis in case studies, most of which were based on a quantitative approach.

Scarcity of Instructor-Focused Research

As noted in other literature reviews, the number of studies highlighting the role of instructors is very limited. Case study would be an appropriate methodology for such research, given that it focuses on the characteristics of unique, specific cases. Case study could help illustrate how instructors experience their involvement in MOOC courses, how they perceive their relationships with colleagues or students, how these differ from relationships in an offline environment, or what motivates them to become instructors. These are research strands that are currently little explored, and case study is a highly flexible methodology that could help to clarify certain aspects regarding the people who perform teaching tasks in these courses.

Limitations

This study has several limitations. First, only the Scopus and WOS databases were used to find case studies, and although these two databases are the most recognized in the academic field, there might be other case studies, in other journals, that were not indexed in these databases. Second, there could be different documents indexed in WOS or Scopus that used case study as a methodology but had failed to explicitly indicate so, and therefore, were not included in this review. Third, by not incorporating articles that have not yet been cited, the study may not reflect the very latest trends in the field (e.g., monetization and business models, big data and learning flexibility, sustainability). Fourth, English, as the language for publications, is over-represented in the WOS and Scopus databases, in the same way that certain scientific fields are more prevalent than others; social sciences, as well as arts and humanities, for example, may be underrepresented (Mongeon & Paul-Hus, 2016). The results of this study are also affected by the rapid evolution of scientific literature on MOOCs in recent years. In this case, it was decided to review solely journal articles and proceedings in order to define the characteristics of these papers in a peer-reviewed process. The authors note that this review did not include a large number of case studies that are available in other formats (e.g., books, blogs, reports, non-indexed journals), or in languages other than English or Spanish, which undoubtedly also form part of the debate in this field of knowledge.

Conclusion

A large number of research papers have been published on MOOCs since their inception, some of which used the case study as a methodology. The data from this review reveals that their prevalence and citation count in databases was limited compared to other empirical works. According to the findings from this analysis of 92 case studies published between 2012 and 2018, (a) more than half of these papers used quantitative methods for data collection and analysis; (b) much of the research focused essentially on learners; and (c) author affiliation was predominantly North American or European, showing a clear geographic bias. Although this study focused on a specific methodology, its findings nonetheless replicated the results of previous studies in which more than one method was examined (e.g., Veletsianos & Shepherdson, 2016; Zhu et al., 2018), and which reported a scarcity of research focusing on instructors, or other studies that found a higher prevalence of quantitative methods (Deng & Benckendorff, 2017; Gasevic et al., 2014). The authors of this paper hope that these findings will encourage future studies on those aspects of MOOCs that have not yet been explored in depth. There are still many possible topics in this area for further research using case study methodology, and the authors recommend that similar reviews of MOOC literature be conducted with regard to other methodological approaches or to different databases containing more research from other regions written in other languages.

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MOOCs Readiness: The Scenario in Malaysia

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Abstract

This study seeks to investigate the readiness levels of adult students studying in Malaysian higher education institutions. The online questionnaire used in this study consists of 18 demographic variables and 43 items based on six constructs: technical competencies, communication competencies, social competencies, self-efficacy, self-directedness, and readiness. With a sample of 413 respondents, the constructs were evaluated using measures based on students' self-identification with each item. Descriptive statistics depict competency, demographic profile of students, and level of readiness. The statistical analyses used for this study were Pearson correlation, multivariate analysis of variance, and structural equation modelling. All six constructs were reliable with Cronbach's alpha (α) above 0.7. Findings indicate that self-efficacy was significant for massive open online course readiness, and additional factors that could influence this readiness are explored. The findings from this study provide important input towards designing effective massive open online courses.

Keywords: massive open online course, readiness, competency, self-efficacy, self-directedness, MOOC

Introduction

The Malaysian Ministry of Education (MOE) in its 2015 education blueprint stated its support for the inclusion of massive open online courses (MOOCs) in tertiary education as a strategy to improve the quality of teaching and learning in the country. In addition to the introduction of a new mode of learning, Malaysian MOOCs would foster healthy competition in teaching and learning among the country's academics and create opportunities for global online learning (MOE, 2015). The most recent development in the use of MOOCs in Malaysia is the publication of the Guideline on Credit Transfer for MOOC by the Malaysian Qualifications Agency (MQA) (MQA, 2016). The establishment of such an environment which supports the use of MOOCs by the government offers a great advantage to the building of the nation's education infrastructure.

The history of MOOCs has its origin in a number of initiatives. At present, there are various forms of MOOCs including the widely known cMOOC and xMOOC. The former is based on the connectivism learning theory: a learning theory drawn from the digital age which was incidentally developed by Downes and Siemens who created the first cMOOC (Sokolik, 2014). The term MOOC has many definitions in literature due to its historical development as independent open access course and widened interest. The European Association of Distance Teaching Universities define MOOCs as "online courses designed for a large number of participants, that can be accessed by anyone, anywhere as long as they have an Internet connection, are open to everyone without entry qualifications, and offer a full/complete course experience online for free" (Jansen & Schuwer, 2015, p. 4). A shorter description of the term MOOC is provided by Sokolik (2014), who describes the MOOC as a: massive (large enrolment in thousands), open (free and not dependent on location, age etc.), online (entirely digital), course (not just depository of materials but structured syllabi with a schedule and the guidance of an instructor). A MOOC can exist as a purely online course involving a community of learners or as a blended mode which brings forth the role of an educator such as in the xMOOC (Sokolik, 2014). A MOOC can also include a certification process that may or may not incur charges. There are also claims of MOOCs with a number of features that may not necessarily represent the aforementioned definition.

According to Eynon (2014), students choose to enrol in MOOCs for a myriad number of reasons, including: intellectual challenge, professional development, and curiosity (as cited in Christensen et al., 2013; Milligan, Littlejohn, & Hood, 2016; Skrypnyk, de Vries, & Hennis, 2015). For institutions of higher learning, benefits of offering MOOCs include the way in which MOOCs: support institutional visibility by enabling institutions to reach out to new students (Porter & Beale, 2015), provide opportunities for academics to be involved in online pedagogy (Jenner & Strawbridge, 2015), and provide course developers the opportunity to collaborate to enhance programme quality (Pscheida et al., 2015). Involvement in MOOCs may also mean heavy investment on new online platforms for many countries (Roland, Uytterbrouck, & Emplit, 2015).

A report by the Department for Business Innovation and Skills, UK, suggests that amidst the benefits of online learning, are huge challenges for existing higher education institutions, especially in the context MOOCs (Haggard, 2013). Some studies suggest that only a small number of students actually complete courses (Koller, Ng, Do, & Chen, 2013; Lee & Choi, 2011; Seaton, Bergner, Chuang, Mitros, & Pritchard, 2015) and that the impersonality of MOOCs leads to students feeling isolated, lonely, and not connected (Kilgore & Lowenthal, 2015). The need for students to be responsible for their own learning is naturally

much greater in MOOCs. The importance of support for successful online learning experiences is emphasised in a 2004 study by Zawacki-Richter, who found that the form and extent of support varies from one student to another. In his research, Tinto (1998) found that enriched student-faculty and student-student interactions could enhance students' sense of belonging and lessen feelings of isolation. Factors such as computer skills or accessibility to the Internet can also determine successful online learning (Selim, 2007). The diversity of MOOC students makes it necessary to not only enhance technical competencies, but also enhance the social and communication competencies to ensure better learning experiences (Roca et al., 2018)

The aforementioned concerns have led research in gauging the readiness of students undertaking a MOOC (Sa'don, Alias, Nakanishi, & Atan, 2017). The appropriateness of assessing readiness for students embarking on online courses is recommended by King and Alperstein (2015). In their research, Kpolovie and Iderima (2016) define the "readiness" of a student as the skills and the behaviour that a student ought to have in order to be successful in his or her learning, and thus suggest that a lack of readiness to learn by the student may have a negative impact on their learning process. The need for students to be ready for learning within the context of MOOCs is further accentuated by the fact that students and teachers are separated by time, distance, and space (Kpolovie & Iderima, 2016).

The purpose of this paper is to discover the state of MOOCs readiness among Malaysian adult students using students' self-identification with specific competencies.

Literature Review

Measuring MOOCs readiness can be likened to identification of the prerequisites to the MOOC's enrolment, which is based on required competencies that would enable a student to pursue a course and complete the associated learning tasks. According to the International Board of Standards for Training, Performance, and Instruction (IBSTPI, 2000), competency is "knowledge, skills, or attitudes that enable one to effectively perform the activities of a given function" (p31). Kerka (1998) argues that "competence is individualized, emphasizing outcomes (what individuals know and can do), and allows flexible pathways for achieving those outcomes" (p3). The five major competencies chosen for this study as most significant in effective online learning are: (i) social competency, (ii) technical competency, (iii) communication competency, (iv) self-efficacy, and (v) self-directedness.

Rutherford, Marthur, and Quinn (1998) define social competency as skills of initiating and managing positive social interactions, relationships (friendships), establishing collaborative networks, and coping effectively in social environments. Communication competency is defined by McCroskey and McCroskey (1988) as adequate ability to transfer information through oral or written format. Technical competency refers to knowledge and skills required to perform a specific task or a group of tasks within a specific job scope (Vathanopas & Thai-ngam, 2007). In Yu and Richardson's (2015) Student Online Learning Readiness (SOLR) Model, all three of these types of competencies are recognised as necessary competencies to measure in order to determine the level of readiness for online courses.

The evaluation of readiness for MOOCs can be different from online learning. The feeling of isolation in a massive environment can be daunting. Willis, Spiers, and Gettings (2013) explored the concept of space in MOOCs, and found that self-efficacy, as well as being surrounded in a community of students) in a MOOC can increase student motivation, participation, and achievement. According to Landine and Stewart (1998), self-efficacy involves one's belief that he or she is able to perform a task. The importance of a student community as highlighted in the aforementioned study by Willis, Spiers, and Gettings (2013) further emphasises social and communication competencies as important factors which influence MOOCs readiness. As Bandura (1993) found a positive relationship between self-efficacy and self-directedness, self-directedness may be an additional factor that could influence the level of readiness among MOOC students. Self-directedness in learning refers to the extent students are responsible for their own learning (Kpolovie & Iderima, 2016). Responsible students carry out a number of tasks independently from identifying their learning needs, searching for resources, to self-evaluation (Kpolovie & Iderima, 2016). They show initiative, independence, and persistence in learning (Kpolovie & Iderima, 2016). According to Beaven, Hauck, Comas-Quinn, Lewis, and de los Arcos (2014), the challenges of being self-directed in a MOOC environment for learners is also compounded by their participatory literacy.

The exploration of the concept of MOOCs readiness can shed more light into students' learning readiness in an open and distributed learning environment.

Conceptual Framework of Study

The conceptual framework of this study was adapted from the SOLR Model proposed by Yu and Richardson (2015). As articulated by Yu and Richardson (2015), the SOLR model was created based on the theories of Tinto (1998) and his Student Integration Model (SIM). Tinto (1998) argues that social and academic integration are the most significant factors for student retention in their course. Social integration occurs when a student experience quality of relationship with the course instructor and classmates, while academic integration occurs when a student is able to improve academic performance and level of intellectual development (Tinto, 1998). According to Tinto, students who achieve higher levels of social and academic integration tend to have strong goal and institutional commitments and as a result, tend not to drop out. Therefore, social competency which influences interactions with both instructors and classmates is deemed significant. The SOLR Model proposed by Yu and Richardson (2015) suggests that communication competency enhances students' interactions with instructors and classmates. Yu and Richardson's (2015) SOLR Model also asserts technical competency as a substantial component that would influence student retention in online learning.

The social, communication, and technical competencies proposed in Yu and Richardson's (2015) SOLR Model for online learning are also applicable to a MOOC as it is essentially an online course with additional features (massive and open). The conceptual framework depicted in Figure 1 incorporates the aforementioned competencies, with two additional independent variables: self-efficacy and self-directedness. Zimmerman and Cleary (2006) having studied the relationship between self-efficacy and self-directedness, suggested that interventions to improve these dimensions can lead to vital developmental

transitions. This could help to improve the level of readiness of students to learn through MOOCs successfully.

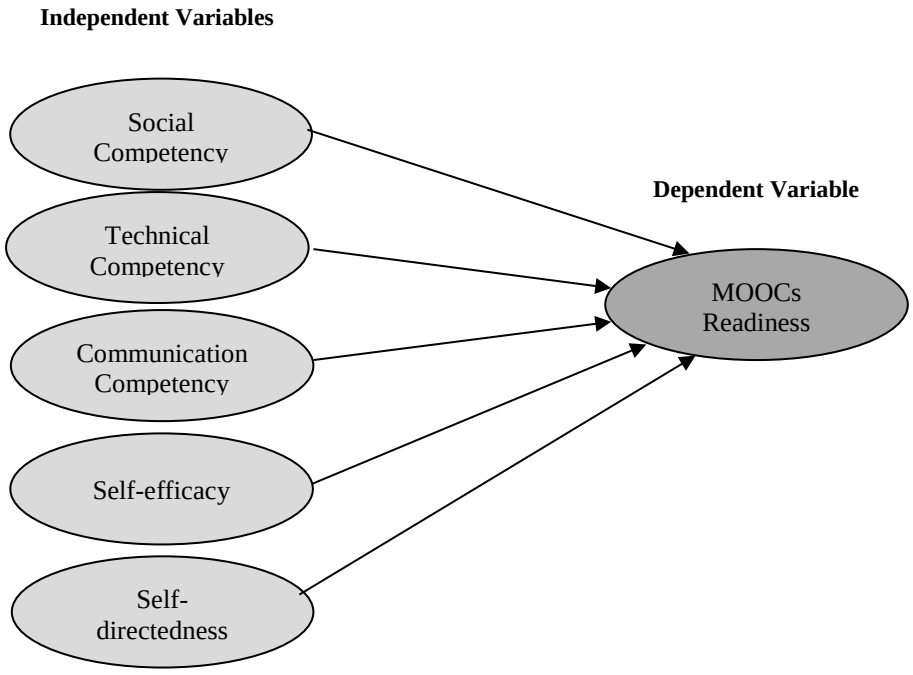

Figure 1. The conceptual framework adapted from "An exploratory factor analysis and reliability analysis of the student online leaning readiness (SOLR) instrument," by T. Yu and J.C. Richarson, 2015, *Online Learning*, *19*(5). Copyright 2015 by the Online Learning Consortium. (https://files.eric.ed.gov/fulltext/EJ1085767.pdf)

Hypotheses

The five hypotheses postulated in this study are:

Hypothesis 1: There is a relationship between social competency and MOOCs readiness.

Hypothesis 2: There is a relationship between technical competency and MOOCs readiness.

Hypothesis 3: There is a relationship between communication competency and MOOCs readiness.

Hypothesis 4: There is a relationship between self-efficacy and MOOCs readiness.

Hypothesis 5: There is a relationship between self-directedness and MOOCs readiness.

Methodology

Sample and Procedure

This study focuses on students in Malaysian higher education institutions, involving students from Open University Malaysia, Malaysian private universities, and other Malaysian public universities such as Universiti Teknologi Malaysia, Universiti Putra Malaysia, and Universiti Malaya, polytechnics and community colleges. A questionnaire was distributed online through Survey Monkey for three months from April to July 2016 using convenience sampling. This resulted in 801 responses, of which 413 were usable. The remaining 388 responses were incomplete with most (more than 90%) questions left unanswered.

Measures

All measures were adapted and modified from published literature. There were three sections in the questionnaire. Section A served to collect demographic information from every respondent including: age, gender, highest level of education, student status, current mode of delivery, type of academic programme, and name of higher education institution. Single item data were also obtained from respondents concerning: access to PC/Laptop/Tablet and Smartphone, access to stable Internet connection, ability to connect files/data and Internet connection anywhere, prior experience attending online courses and/or MOOCs, and intentions to enrol in MOOCs in 2017. One open-ended item was included in the questionnaire to identify factors that influence students' motivations for taking MOOCs. Section B had constructs measured on an Ordinal Scale from 1 (Strongly Disagree) to 4 (Strongly Agree) based on students' self-identification with each item. The constructs measured technical competency, communication competency, social competency, self-efficacy, and self-directedness. Technical competency had nine items, communication competency had six items, social competency had seven items, self-efficacy had five items, and self-directedness had five items. Section C measured the construct of MOOCs readiness on an Ordinal Scale from 1 (Strongly Disagree) to 4 (Strongly Agree) using 11 items. The measurement framework of the questionnaire is summarised in Table 1.

Table 1

Measurement Framework of the Questionnaire

Item	Measurements	Scale	Literature
1-16	Section A Demographic profile Age, gender, highest level of education, student status, current mode of delivery, type of academic programme, name of higher education institution, access to PC/Laptop/Tablet/Smartphone, access to stable Internet connection, ability to connect files /data anywhere, prior experience in online courses, prior experience in MOOCs, intentions to enrol in MOOCs in 2017, and Motivation for taking MOOCs	Nominal scale Open-ended	N/A

17-51	Section B: Competencies		
	Technical competency	1-4 Ordinal scale	(Yu & Richardson, 2015)
	Communication competency	1-4 Ordinal scale	(Yu & Richardson, 2015)
	Social competency	1-4 Ordinal scale	(Yu & Richardson, 2015)
	Self-efficacy	1-4 Ordinal scale	(Mercado, 2008)
	Self-directedness	1-4 Ordinal scale	(Mercado, 2008)
52-62	Section C: MOOCs readiness	1-4 Ordinal scale	(Mercado, 2008)

Statistical Analyses

Statistical Package SPSS (Version 22) for Windows was used to process and analyse the data. Reliability analysis was used to test against the generally acceptable limit based on Cronbach's alpha value of 0.7. Statistical validity tests including composite reliability tests and confirmatory factor analysis (CFA) were carried out. Structural equation modeling (SEM) analysis using AMOS 24.0, which is a comprehensive statistical approach for testing theoretical hypotheses about the relationships among observed and latent variables (Hoyle, 1995) was also carried out. The normality of data were assessed based on the measure of skewness.

Results

Demographic Profile

Respondents in this study were largely (62.2%) students from Open University Malaysia (known as OUM) while the remaining 37.8% were from private and public higher education institutions, polytechnics, and community colleges. As shown in Table 2, the ratio of female to male respondents was 64:36. Respondents between the ages of 18-25 years old account for 22.8% (almost a quarter) of the sample, while respondents between 26-45 years old account for 64.4%. The remaining 12.8% of the sample was made up of respondents above 46 years old. About a quarter of the respondents (24.5%) reported that they were registered with their institutions with a bachelor's degree as their highest level of education. A larger percentage (34.9%) of the respondents reported that they were registered with their institutions with a diploma level, and 129 respondents (31.2%) reported being enrolled with SPM/O-level or equivalent. Less than 10% of the respondents reported having a master's degree. A very small percentage of respondents (less than 2%) stated that they have doctorate/PhD qualification. A large number of respondents reported that they were pursuing academic programmes at the bachelor's level (65.6%), while others were pursuing either a certificate/diploma (9.0%), or postgraduate studies (24.6%). The respondents were categorised as 'undergraduate' and 'postgraduate' students onwards. Almost all respondents (92.5%) reported that they were part-time students. Only a small number of respondents were involved in fully online courses. Some students could have been involved in more than one course with a different delivery mode.

In terms of accessibility to a PC/Laptop/Tablet and a Smartphone, more than 95% answered 'yes'. However, access to stable Internet connection was slightly less (85.0%), whereby about 10% respondents reported having poor Internet connection. 74.8% of students reported being able to connect to their files, data, and Internet connection wherever they are, suggesting a quarter of the respondents are not mobile.

The majority of respondents (70%) reported that they had not taken fully online courses before and an even higher percentage (91.3%) had not enrolled in any MOOC. Although the descriptive data shows that the majority of respondents have limited experience in a fully online course and an even more limited exposure to MOOCs, a large number of respondents (62%) reported that they had plans to enrol in a MOOC in 2017.

Table 2

Demographic Profile of Adult Students

Demographic profile	n	%
Gender		
Male	150	36.3
Female	263	63.7
Age		
18 - 25 years	94	22.8
26 - 35 years	154	37.3
36 - 45 years	112	27.1
46 - 55 years	38	9.2
More than 55 years	15	3.6
Highest level of education		
PMR	3	0.7
SPM/O-levels or equivalent	129	31.2
Diploma	144	34.9
Bachelor's	101	24.5
Master's	30	7.3
Doctorate/PhD	6	1.5
Student category		
Full time	31	7.5
Part time	382	92.5
Current mode of delivery		
Fully online (no face-to-face)	72	17.4
Blended (online and face-to-face)	324	78.5
Not online (face-to-face only)	67	16.2
Academic programme		
Certificate	3	0.7
Diploma	37	9.0
Bachelor's	271	65.6
Master's	80	19.4
PhD	22	5.3
Access to a PC/Laptop/Tablet	404	97.8
Have a smartphone	398	96.4
Access to a stable Internet connection	351	85.0

Able to connect to files/data and the Internet connection wherever	309	74.8
I have taken a fully online course before this semester	124	30.0
I have attended online classes (e.g. virtual classrooms)	125	30.3
I have enrolled in a MOOC	36	8.7
I plan to enrol in a MOOC in 2017	256	62.0

Many respondents (71.4%) reported that their motivation to enrol in a MOOC is derived from a desire to widen their knowledge. Students' interest in pursuing knowledge suggests that students are self-motivated and have a high level of intrinsic motivation. Half of the respondents (51.1%) wished to enrol in MOOCs as a self-initiative towards "continuous professional development." About 50% respondents indicated "exposure to online learning" as their motivation to enrol in MOOCs. Close to 40% of the respondents were motivated by "personal interest," "networking purposes," and "adding value to their resumes." Some respondents (27%) indicated that enrolling in a MOOC was "part of a compulsory course." Around 22% reported "socialising" as their motivation. Lastly, 18 % of respondents were motivated by the need to "gain credit for university entrance." Respondents' motivations to enrol in MOOCs in order of priority are shown in Table 3.

Table 3

Motivation for Enrolling in a MOOC

Enrol in a MOOC course	n	%
To widen knowledge	295	71.4
Continuous professional development	211	51.1
Exposure to online learning	209	50.6
Networking	162	39.2
Personal interest	162	39.2
Added value to resume	141	34.1
Compulsory university course	110	26.6
Socialising	92	22.3
Credit for university course	76	18.4

Descriptive Statistics

Table 4 shows descriptive statistics, including the means, standard deviations, minimums, and maximums of the four factors measured. The items in both social and communication competencies collapsed under a single construct (socio-communication competency). The results show that the highest mean (3.15) is obtained for self-directedness, followed by technical competencies (3.14), socio-communication competencies (3.03), and self-efficacy (2.83). The mean for MOOCs readiness is only 2.64. The results indicate that the respondents are moderately ready for MOOCs, but their level of readiness poses a concern for their ability to learn successfully through MOOCs. The respondents believe they have the competencies and are self-directed. However, the low mean in self-efficacy suggests the need for strategic interventions to improve the construct.

Table 4

Means and Standard Deviations of the Four Factors Influencing MOOCs Readiness

Factors	*M*	SD	Minimum	Maximum
MOOCs readiness	2.64	0.63	1	4
Socio-communication competency	3.03	0.48	1	4
Self-efficacy	2.84	0.63	1	4
Technical competency	3.13	0.47	1	4
Self-directedness	3.15	0.46	1	4

Correlation

The Pearson Correlation Matrix in Table 5 shows correlations between MOOCs readiness and socio-communication competency, technical competency, self-efficacy, and self-directedness. MOOCs readiness is significantly correlated with all four factors. The highest correlation is between MOOCs readiness and self-efficacy (r = 0.553), followed by socio-communication competency (r = 0.511), self-directedness (r = 0.484), and technical competencies (r = 0.440). The relatively low mean in self-efficacy indicated in the previous table raises a concern. Efforts are crucial in identifying the required support and effective mechanisms to raise students' self-efficacy levels toward successful learning through MOOCs. The growing importance of support in online education as well as in MOOCs due to its pedagogical challenges is also highlighted by Zawacki-Richter (2004).

Table 5

Correlation Analysis – Pearson Correlation Matrix

	MOOCs readiness	Socio-communication competencies	Self-efficacy	Technical competencies	Self-directedness
Socio-communication competency	.511**	1			
Self-efficacy	.553**	.646**	1		
Technical competency	.440**	.673**	.540**	1	
Self-directedness	.484**	.722**	.643**	.592**	1

Note. ** Correlation is significant at the 0.01 level (2-tailed).

Multivariate Repeated One-Way Anova (MANOVA)

MANOVA Hotelling's Trace output revealed there is no significant difference between male and female students, and among students of different age groups ($p>0.05$) on MOOCs readiness, as shown in the Table 6. However, there is a significant difference between mode of delivery in the MOOCs readiness dimensions ($F=5.040$, $p<0.000$).

Table 6

F-tests: Gender, Age, and Mode of Delivery on MOOCs Readiness Dimensions

	Value	F value	Hypothesis df	Error df	Sig.
Hotelling's trace					
Gender	.018	1.439[b]	5.000	407.000	.209
Age	.049	.996	20.000	1610.000	.464
Mode of delivery	.124	5.040	10.000	810.000	.000

A follow-up post hoc analysis in Table 7 shows that mode of delivery made a significant difference in mean scores of socio-communication competency ($F=9.91$, $p<0.000$), self-efficacy ($F=21.21$, $p<0.000$), technical competency ($F=8.11$, $p<0.000$), self-directedness ($F=7.42$, $p<0.000$), and MOOCs readiness ($F=13.09$, $p<0.000$). The result shows that students who took blended and fully online courses rated socio-communication competency and technical competency (Scheffe's post hoc analysis, $p<0.000$) significantly higher than students who took face-to-face courses. Students who took fully online courses rated self-efficacy and self-directedness (Scheffe's post hoc analysis, $p<0.000$) significantly higher than students who took blended and face-to-face course. In addition, students who took fully online and face-to-face courses rated MOOCs readiness (Scheffe's post hoc analysis, $p<0.000$) significantly higher than students who took blended courses.

Table 7

Descriptive Statistics and F-test of Mode of Delivery on MOOCs Readiness Dimensions

Variable	*Mean* (SD)			F	Scheffe's Test
	Blended	Fully online	Face-to-face		
Socio-communication	3.03 (0.47)	3.18 (0.47)	2.83 (0.43)	9.91**	(1)>(3), (2)>(3)
Self-efficacy	2.87 (0.60)	3.08 (0.61)	2.44 (0.64)	21.21**	(2)>(1),(3)
Technical	3.15 (0.45)	3.24 (0.45)	2.94 (0.48)	8.11**	(1)>(3), (2)>(3)
Self-directedness	3.15 (0.46)	3.30 (0.42)	3.00 (0.48)	7.42**	(2)>(1),(3)
MOOCs readiness	2.67 (0.61)	2.80 (0.62)	2.31 (0.57)	13.09**	(3)>(1), (2)>(3)

Note. **$p<0.000$.

Structural Equation Modeling (SEM)

In the path diagram of structural equation modeling (SEM), the unobserved variables (exogenous) or factors and error terms operate as independent variables (socio-communication competency, technical competency, self-efficacy, and self-directedness) and MOOCs readiness operate as the observed variables/dependent variables (endogenous). Error values show the extent to which the latent factor does not explain a measured variable.

As shown in Figure 2, the standardised beta estimates for effect of socio-communication competency, self-efficacy, technical competency, and self-directedness on MOOCs readiness are 0.11, 0.31, 0.15, and 0.10, respectively. The measure of correlation between exogenous constructs socio-communication competency and self-efficacy is 0.68; socio-communication competency and technical competency is 0.80; socio-

communication competency and self-directedness is 0.77; self-efficacy and technical competency is 0.63; self-efficacy and self-directedness is 0.71; and technical competency and self-directedness is 0.70. These values indicate that the discriminant validity between exogenous constructs is achieved and the two constructs are not redundant (correlations below 0.85). The coefficient of determination R^2 is 0.36. The figure indicates the contribution of exogenous constructs (socio-communication competency, self-efficacy, technical competency, and self-directedness) in estimating the endogenous construct in MOOCs readiness is only 36%. These results indicate that a large percentage of the variance (64%) remains unknown. In other words, there is a room for exploration of new factors that may significantly influence MOOCs readiness.

The normality for the data assessed using the measure of skewness for every item resulted in an absolute value of less than 0.7, suggesting that the data measured and therefore the constructs are normally distributed.

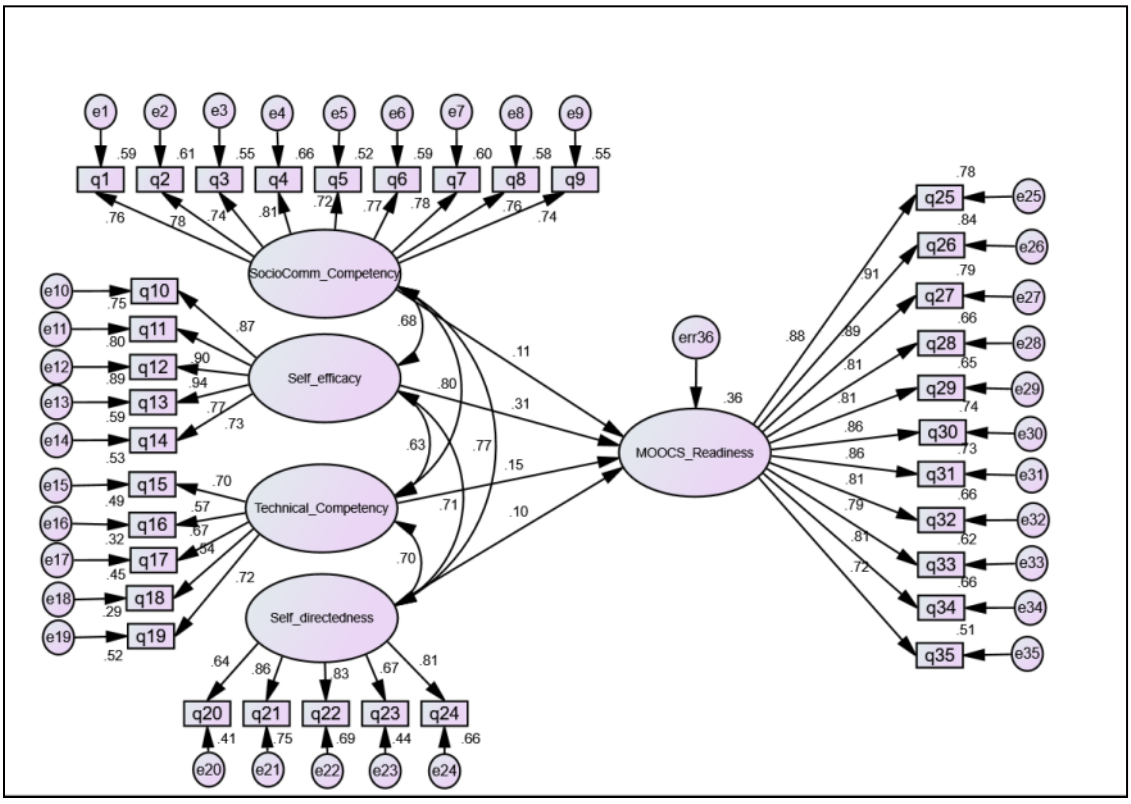

Figure 2. Schematic diagram of model.

Validity and Reliability of Measurement Model

Table 8 shows that factor loading (FL) values exceed 0.50, Cronbach's alpha (CA) values exceed 0.7, and composite reliability (CR) values are above 0.6. The average variance extracted (AVE) values are above 0.5 except for technical competency (0.412). Item analysis can be conducted in future studies to improve the obtained alpha values. It can be concluded that the convergent and discriminant validities of the constructs in the presented model are generally acceptable.

Table 8

Factor Loading, Cronbach's Alpha, Composite Reliability, and Average Variance Extracted

Construct and items	FL	CA	CR	AVE
Socio-communication competency		0.93	0.925	0.744
I am comfortable in responding to other people's ideas	0.742			
I am comfortable in seeking for help when necessary	0.788			
I am able to express myself in a clear manner				
I am able to give constructive feedback to others	0.740			
I am comfortable in expressing my opinion in writing to others	0.815			
I am able to express myself without offending people	0.692			
I am confident in posting my questions online if I do not understand something	0.766			
I am able to connect with others (peers and tutors) with ease	0.781			
I am keen on meeting many new peers in my online course	0.770			
	0.746			
Self-efficacy		0.92	0.925	0.713
I find learning online is highly engaging and interesting	0.867			
I learn well in my online course	0.897			
I am confident that I can perform well in an online course	0.943			
I believe anyone can learn through an online environment	0.766			
I am confident in using ICT system and tools in my studies	0.731			
Technical competency		0.77	0.776	0.412
I am able to download useful resources from the Web	0.697			
I communicate through emails to connect to others	0.565			
I am able to access digital library				
I use social medias to connect to others	0.668			
I am able to collaborate with others through online forums / discussions	0.537			
	0.723			
Self-directedness		0.87	0.876	0.589
I have high expectations for doing well in my studies	0.640			
I set up my learning goals and study plan independently	0.864			
I manage my studies in accordance to my study plan				
I seek assistance when I am unable to solve problems on my own	0.833			
I am independent in seeking for resources and completing my learning tasks	0.665			
	0.809			

MOOCs readiness		0.96	0.961	1.089
I would take up MOOCs if it is equivalent to a conventional course	0.879			
I look forward to engage in MOOCs	0.896			
I like to learn more about MOOCs	0.864			
I would take up MOOCs only if it contributes towards a degree	0.812			
I would take up MOOCs only if they are accredited by the Malaysian Qualifications Agency (MQA)	0.805			
I am ready to enrol in a MOOC	0.868			
I can commit the time needed to complete a MOOC	0.867			
I am prepared to learn in a big group	0.818			
Searching for MOOCs	0.788			
I am open for online assessments	0.817			
I am willing to spend money on MOOCs	0.730			

Table 9 shows that the number of distinct sample moments is 630. Number of distinct parameters to be estimated is 80 and degree of freedom (630-80) is 550. These suggest that the model studied is an over-identified model. The χ^2-to-df ratio is less than 5. Alternative measure of fit is used instead of Chi-square. Absolute fit indices in Table 10 shows goodness of fit, GFI = 0.819, root mean square residual, RMR = 0.021, root mean square error of approximation, RMSEA = 0.064, and comparative fit index, CFI = 0.921. RMR, RMSEA, and CFI values indicate that a good fit was found for the model proposed in the study.

Table 9

Notes for Chi-Square (χ^2) Model

Chi-square model	
Number of distinct sample moments	630
Number of distinct parameters to be estimated	80
Degrees of freedom	550
Chi-square	1602.815*
Probability level	0.000

Note. *Minimum was achieved.

Table 10

Estimation of Model Parameters and Model Fit Measurement Statistics

Fit indices	Model index value	Comments
χ^2 ($p>0.05$)	1602.815 ($p<0.001$)	The required level is not achieved
GFI > 0.90	0.805	The required level is not achieved
RMR <0.08	0.022	The required level is achieved
RMSEA < 0.08	0.068	The required level is achieved
CFI > 0.90	0.909	The required level is achieved

Note. GFI measure is affected by sample size. From "A simulation study to investigate the use of cutoff values for assessing model fit in covariance structure models," by S. Sharma, S. Mukherjee, A. Kumar, and W.R. Dillon, 2005, *Journal of Business Research, 58*(7). Copyright 2004 by Elsevier. doi: 10.1016/j.jbusres.2003.10.007

Table 11 shows the test results on the hypotheses proposed. Among the competencies, only self-efficacy has a significant relationship with MOOCs readiness. As such, the need for further exploration of new factors is further emphasised.

Table 11

Result on Hypothesis

Hypothesis statement of path analysis	Beta estimate	Standard error	Critical region	P-value	Result on hypothesis
Hypothesis 1: There is a relationship between socio-communication competency and MOOCs readiness	0.124	0.152	1.218	0.223	Not supported
Hypothesis 2: There is a relationship between technical competency and MOOCs readiness	.148	0.132	1.515	0.130	Not supported
Hypothesis 3: There is a relationship between self-efficacy and MOOCs readiness	.314	0.084	4.563	***	Supported
Hypothesis 4: There is a relationship between self-directedness and MOOCs readiness	.101	.112	1.183	0.237	Not supported

Note. *** P-value < 0.05.

Discussion

The findings in this study show that self-efficacy has a significant relationship with MOOCs readiness. This suggests that the inclusion of the self-efficacy dimension in the proposed model is highly relevant. The importance of self-efficacy in a MOOC environment was highlighted by Willis et al. (2013). The role of self-efficacy in academic and personal development among adolescents is also well supported by the work by Bandura (1993). The work by Willis et al. (2013) also suggested how self-efficacy among students can be improved by improving their prior learning experiences. This effort is crucial for MOOCs students in Malaysia who display low self-efficacy. Effective use of this strategy requires efforts to create a positive learning experience for students. The incorporation of a self-efficacy component into the design of entrance evaluation systems for online courses and/or MOOCs could help providers identify students who may need additional support. Further research into other possible mechanisms to improve self-efficacy among students enrolled in MOOCs is important.

According to the results of the research at hand, self-directedness or self-regulated learning behaviour does not significantly influence MOOCs readiness. Self-directedness identified as the ultimate aim in lifelong education is an important dimension in this study (Manning, 2007). Self-directedness may be understood as a multifaceted process which integrates several phases including self-motivation, self-control, self-observation, and self-reflection (Zimmerman & Cleary, 2006). Self-directedness can support self-set goals in both academic and personal development areas (Zimmerman & Cleary, 2006). This is rather surprising considering the close relationships between the self-efficacy and self-directedness. Nevertheless, the scope covered under self-efficacy is focused on students' belief in their ability to learn in an online environment

and not their belief in their ability to self-regulate their learning activities. The relationship between the construct and the items under the self-directedness construct should be reviewed again in further studies.

The lack of a strong correlation between socio-communication competency and MOOCs readiness is also surprising. A collaborative learning environment, which is a key feature in many MOOCs, emphasizes the need for this skill to ensure active participation. Connecting with people (social construct) was also identified as one of four main motivations among MOOC students by Milligan and Littlejohn (2017). The need for socio-communication skills is seen as important for successful learning in a MOOC environment where the presence of a community of learners is identified as an important factor (Willis, Spiers, & Gettings, 2013). Perhaps socio-communication competency ought to be analysed as three separate constructs: social, communication, and language competencies. Further exploration of key factors could also consider collaborative learning skills as a possible factor.

Technical competency was also found to be not significant in relation to the level of MOOCs readiness. In this study, respondents' accessibility to digital technology such as PC/Laptop/Tablet/Smartphone (above 95%), accessibility to a stable Internet connection (about 85%), and the ability to connect to files and data with the Internet (at 77.1%) were relatively high. This suggests that respondents were relatively exposed to the Internet and are familiar with digital technology. While technical competency is necessary, students may perceive it as an inherent competency.

Further studies could also focus on redesigning the method of measuring readiness by introducing direct measures and in-depth analyses. Identified demographic factors could be widened to include students' disciplines. The scope of study on MOOCs may also explore research on innovative pedagogies. Many Malaysian MOOCs categorised as xMOOCs use a pedagogical approach resembling traditional courses such as pre-recorded video lectures of the traditional lecture format, and automated exercises and quizzes with opportunities to interact with fellow students and course instructors through discussion boards or chat functions (Porter & Beale, 2015). Such xMOOCs are more content-oriented and use a unidirectional approach (Andone, Mihaescu, Ternauciuc, & Vasiu, 2015). Therefore, there is a need to pay close attention to pedagogy to create an effective learning environment. A learning model based on an open learning environment proposed by Kop, Fournier, and Mak (2011) might be a better model for designing MOOCs. The design of a MOOC needs to consider the challenge of having a diverse and large number of participation s. Thus, understanding students' learning behaviours and the support they need are crucial for successful learning in MOOCs.

Conclusion

This study explores the adaptation of the Student Online Learning Readiness (SOLR) Model to predict MOOCs readiness among Malaysian adult students. The adapted model investigates the use of five competencies in predicting MOOCs readiness, namely: (i) social competency, (ii) communication competency, (iii) technical competency, (iv) self-efficacy, and (v) self-directedness. A total of 413 data sets were analysed in this study using SPSS and SEM. Findings from this study clearly identify self-efficacy as a

determinate of MOOCs readiness. The relatively low mean value for the self-efficacy competency suggests a need for effective measures to increase the level of self-efficacy among Malaysian adult students. The findings also imply the need for further exploration of factors influencing MOOCs readiness. Further studies could enrich existing knowledge on learning behaviours. Further studies regarding MOOCs could also significantly contribute to the field of open and distributed learning.

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Teachers as Connected Professionals: A Model to Support Professional Learning Through Personal Learning Networks

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Abstract

As education becomes increasingly complex, effective continuing professional learning is an important strategy to support teachers in schools. However, current professional development approaches may not meet contemporary teachers' needs. Seeking to enhance teachers' professional learning opportunities, this paper presents a model of learning as a connected professional. The model draws upon the findings of a qualitative case study of 13 teachers who interact with others through a personal learning network (PLN).

Theories of connectivism, networked learning, and connected learning underpin the model, which conceptualises the whole experience of learning as a connected professional. The model comprises three elements: arenas of learning, teacher as learner, and PLN. Key characteristics of the experience are practices described as linking, stretching, and amplifying. These practices recur in various ways across all three elements of the model. The model promotes professional learning that is active, interest-driven, and autonomous, meeting personal learning needs while being socially connected.

Keywords: Personal learning network, professional learning, networked learning, model, teachers

Introduction

For school teachers, the increasing complexity of professional practice calls for sophisticated, ongoing professional learning. The literature suggests teacher agency, collaboration, and active participation create enduring changes in practice (Desimone & Garet, 2015); however, traditional models of professional development are often discrete events, disconnected from practice and of limited impact (Calvert, 2016). There is continuing disparity between what is known to be effective, and what teachers experience (Edge, Reynolds, & O'Toole, 2015; Webster-Wright, 2009). In response, this paper presents an innovative model that draws upon the affordances of social technologies for professional learning through a personal learning network (PLN).

A PLN connects people and resources for informal professional learning. While there is a body of anecdotal evidence and professional literature describing the nature of PLNs (Moreillon, 2016; Nussbaum-Beach, 2013; Warlick, 2009), fewer studies have investigated teachers' interactions through PLNs (Prestridge, 2017, 2019; Trust, Krutka, & Carpenter, 2016). The latter studies recognise the shift towards self-directed and interest-based professional learning, and reveal the potential for PLNs, with their dynamic and diverse nature, to meet the needs of teachers seeking professional learning.

This paper presents a model of professional learning based on case studies of 13 teachers. First, we situate this research within current literature about teachers' professional learning needs, and PLNs. Then, we outline the theoretical framework and design of the research from which the model emanated. The main part of the paper details the nature and constituent elements of the model. The paper concludes with a discussion of the potential for the model to facilitate the transformative experience of learning as a connected professional when teachers engage with professional learning through a PLN.

Literature Review

Teachers are experiencing increasingly complex contexts, rapid change, and high demands for accountability (Huitt & Monetti, 2017; Mockler & Groundwater-Smith, 2009). They are challenged to maintain their professional learning to meet the needs of students and expectations of external stakeholders (Hargreaves, 2000; Sachs, 2011).Within this environment, creating opportunities for relevant, collaborative, and impactful professional learning remains problematic.

A growing body of research investigates how teachers learn collaboratively through professional interactions both online and offline. This includes examinations of teachers' communities of practice and professional learning communities (Cochran-Smith & Lytle, 1999; Macià & García, 2016; Stoll, Bolam, McMahon, Wallace, & Thomas, 2006; Wenger, 2010) and networked learning communities (Katz & Earl, 2010; Lee, Rahmat, Heng, Li, & Hwee, 2018; Mackey & Evans, 2011).

When investigating learning through social networks, researchers generally take one of two fundamental approaches. A whole-network approach analyses patterns of connections and interaction from a birds-eye perspective (Haythornthwaite & de Laat, 2010; Moolenaar, 2012; Smith Risser & Bottoms, 2014). The second approach examines the network from the perspective of the individual (Haythornthwaite & de Laat, 2010). This perspective is notable for its relational focus on the learning of individual teachers who have created personal networks to meet their own strategic goals. Studies taking the latter approach include those which focus on personal networks developed by teachers to support and enhance their professional learning (Baker-Doyle, 2012; Van Waes et al., 2016). One type of learning network that is directed by the individual is the personal learning network (PLN).

A PLN is a network of people, information, and resources that an individual strategically develops using social technologies to access informal learning (Couros, 2010; Nussbaum-Beach, 2013; Trust et al., 2016; Warlick, 2009). The individual nature of the PLN differentiates it from a learning community or community of practice, where participants typically work together towards shared goals (DuFour, 2004; Haythornthwaite & de Laat, 2010; Wenger, Trayner, & de Laat, 2011). The PLN allows the individual to exploit the affordances of social technologies in connecting people or information at any time or place (Carpenter & Krutka, 2015; Ranieri, Manca, & Fini, 2012; Visser, Evering, & Barrett, 2014).

Although PLNs have received attention in the professional literature (Moreillon, 2016; Nussbaum-Beach, 2013; Warlick, 2009; Way, 2012; Whitby, 2013), empirical research which explores the experience of teachers engaging through PLNs is limited. The majority of studies focused on bounded spaces, which concern either interaction within a single, specifically designed community (Cho, 2016; Hur & Brush, 2009; Tseng & Kuo, 2014), or one particular platform, such as Twitter or Facebook (Ranieri et al., 2012; Visser et al., 2014). More holistic studies of direct relevance to our research include a large survey that explored teachers' interactions through PLNs (Trust et al., 2016), and a smaller study of how expert ICT teachers perceive and enact professional learning through social technologies (Prestridge, 2019).

The original model of professional learning presented in this paper contributes to the body of research that explores how teachers engage with professional learning through their PLNs. This model innovatively integrates understandings of networked learning, connectivism, and connected learning. It informs the operationalisation of self-directed online professional learning for teachers who seek agentic social learning which is active and authentic (Couros, 2010; Couros & Hildebrandt, 2016; McLoughlin & Lee, 2010; Prestridge, 2019).

Theoretical Framework

The theoretical concepts of networked learning, connectivism, and connected learning underpin the model of learning as a connected professional. These concepts relate to learning that takes place through social, networked, and connected learning environments, mediated by social technologies. While they stand alone, they also flow into and build upon each other.

Networked learning focuses upon connections between individuals, groups, and learning resources which are mediated by technology (Jones, 2015). In particular, social technologies increase access to information and resources and enable people to work together regardless of time and space (Weeks, 2012). Networked learning also examines ties, relations, and network formations as well as their influence upon the learner and learning (Haythornthwaite & de Laat, 2010). The learner, their relations with others, and the context within which the learning takes place are all considered of value from the networked learning perspective.

Connectivism, which is closely related to networked learning, explains how learning occurs within networked digital environments (Downes, 2010; Siemens, 2005). A key principle of connectivism is that knowledge extends across multiple nodes within nebulous digital environments. Learning is the active process of creating connections between these nodes (Siemens, 2005). The learner may see patterns and create connections between nodes; therefore, the capacity to know is more important than what is already known (Siemens, 2005). Connectivism suggests that although knowledge is socially constructed, learning is driven autonomously by the individual (Tschofen & Mackness, 2012). Through

the connectivist lens, successful networks are characterised by the features of autonomy, diversity, openness, interactivity, and connectedness (Downes, 2010, 2012).

Connected learning presents a pedagogical approach to learning within networks. Gogia (2016, p. 90) suggests that connected learning and networked learning have "almost identical underlying assumptional frameworks, specifically, that learning and education should be self-determined, social, relevant, equitable and accessible." The pedagogical framework of connected learning is also informed by connectivism, encouraging learners from different contexts to make connections as they co-construct knowledge and understanding (Ito et al., 2013). These connections are motivated by shared purposes and mutual interests within a flexible, networked enterprise, emerging through participation in culture and community (Ito et al., 2013).

Research Design

The empirical model presented in this paper builds upon the findings of a qualitative collective case study. A collective case study examines individual cases, before drawing cross-case comparison, thus gaining the in-depth, contextual insights of each individual as well as a rich understanding across a spectrum of viewpoints (Simons, 2009; Thomas, 2016). This research investigated the phenomenon of teachers' experience of learning through a PLN. The lead author recruited 13 practicing teachers (9 female, 4 male), from primary and secondary schools in various international locations. Selection criteria required that participants were currently practicing teachers who engaged at least weekly with social media for the purposes of professional learning. The participants held various roles including classroom teacher, technology integrationist, teacher librarian, and primary years program co-ordinator. Their years of teaching experience ranged between 6 and 41 years. The lead author conducted semi-structured interviews lasting 45 to 60 minutes via a web conference platform.

In preparation for their interview, participants constructed a visualisation of their PLN (diagram or sketch). During the interview they explained their visualisation and discussed their experience of learning through their PLN. Participants also recounted critical incidents that had been significant or memorable for them. This involved the teachers explaining their thoughts, feelings, and actions in light of a particular event or experience (Butterfield, Borgen, Amundson, & Maglio, 2005; Hughes, 2012).

The verbatim interview transcripts underwent thematic data analysis (Braun & Clarke, 2012). The lead author coded the transcripts separately to ensure consideration of each participant as a separate case. Cross-case analysis (Simons, 2009; Thomas, 2016) then revealed broader insights into how teachers use social technologies to create timely, contextual and personalised professional learning experiences.

Case Study Findings

The case study findings suggest that professional learning through a PLN creates opportunities for teachers to enhance their pedagogical knowledge and practice, develop perceptions of themselves and others as teachers, and contribute to the wider teaching profession and beyond. In addition, the research indicates that teachers' experience of professional learning through a PLN is highly personal, with variation depending upon their individual learning purposes, characteristics as a learner, and the structure of their PLN. The study's overarching finding is that teachers' experience of professional learning through a PLN can be conceptualised as learning as a connected professional. This major finding is encapsulated in the model proposed below.

A Model for Learning as a Connected Professional

The model depicted in Figure 1 indicates that learning as a connected professional incorporates three interrelated elements: (a) the context, which comprises three arenas of learning (i.e., pedagogical, personal, and public); (b) the teacher as learner, who is characterised by various attributes; and (c) the PLN, which mediates professional learning through social technologies.

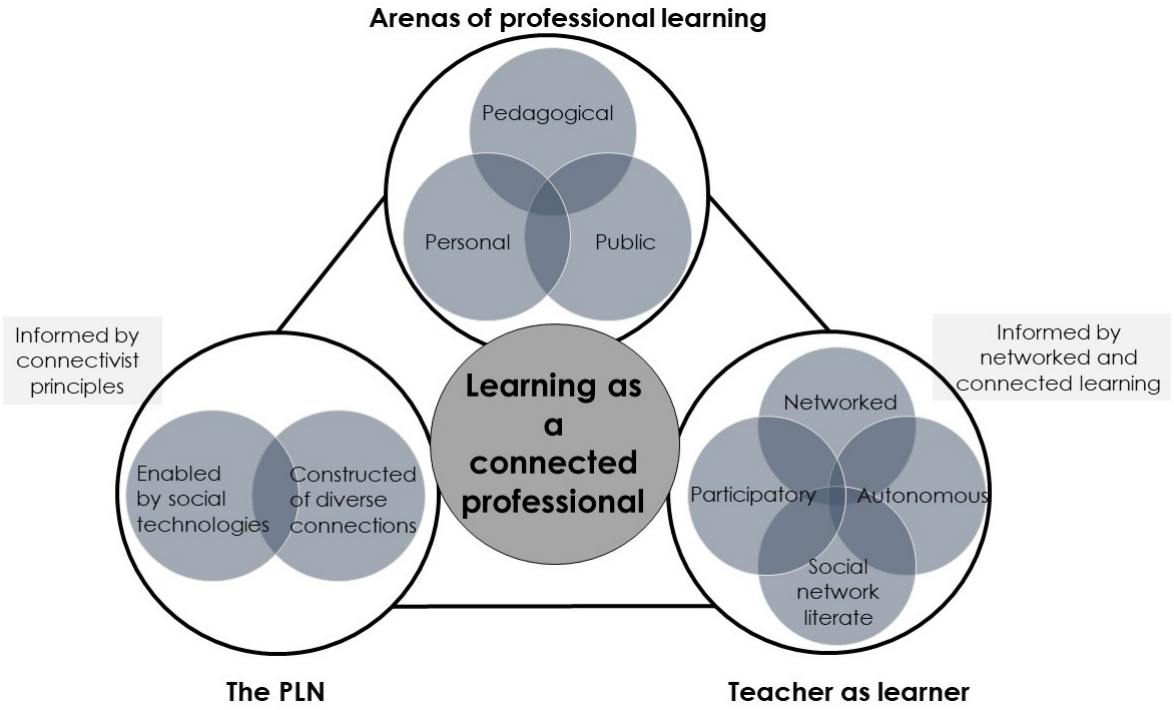

Figure 1. Learning as a connected professional.

Linking, stretching and amplifying practices recur in various ways across all three elements of the model, and represent the key characteristics of the experience of learning as a connected professional. Linking is driven by pragmatism, as the teacher connects effectively and efficiently with people or resources to meet immediate or near future professional learning needs. Stretching is associated with discovery, expansion of the network, and curiosity. Amplifying involves active contribution, creativity, and knowledge formation, as well as collaborative co-construction, and remixing or redistribution of information and resources.

We now will consider each element of the model in turn, through the lens of linking, stretching and amplifying. Brief examples from the participants' experience illustrate the authenticity of the model.

The Arenas of Professional Learning

Professional learning through a PLN creates opportunities for teachers to experience learning as a connected professional across pedagogical, personal, and public arenas. These arenas are the context in which teachers enhance their pedagogical knowledge and practice, develop perceptions of themselves and others as teachers, and contribute to the wider teaching profession and beyond. Within each of the arenas, teachers may engage in linking, stretching and amplifying practices.

The pedagogical arena. This arena is the space in which teachers extend and enhance their content knowledge and practice. Teachers relate their learning through their PLN to the work they do

within their own classrooms, or within the context of their school. The pedagogical arena assists teachers to update and refresh their knowledge, and to seek advice and further support when implementing curricular or pedagogical change. This learning is associated with the teacher's current activities, exemplified by one participant who commented that:

> On the spot I was able to feed it through . . . and my colleague would go 'that's fantastic! Let's implement that!' so rather than sitting and reading through books, it was just a quick Tweet, or an article that came across Facebook.

In the pedagogical arena, teachers link, stretch, or amplify their professional learning through a variety of practices (see Table 1). Linking occurs when teachers engage with simple question and answer interactions to resolve technical queries or identify appropriate resources. When stretching their professional learning, teachers use their PLN as a source of inspiration and innovation, updating their practice, and introducing new pedagogical approaches. When amplifying their professional learning, teachers work with their connections synchronously and asynchronously to conduct inquiry or research, and to create new knowledge in the design of curriculum or pedagogy.

Table 1

Teachers' Practices in the Pedagogical Arena

Teachers' practices	Ways in which content knowledge and practice are enhanced	Outcomes
Linking	Linking to others for everyday problem solving, asking and answering questions of a technical or practical nature.	Improved teaching skills
Stretching	Stretching network to include new connections to stay up-to-date with pedagogical and curricula changes. Designing or redesigning pedagogical approaches or curricula.	Updating or implementing new content knowledge or pedagogical skills
Amplifying	Amplifying new knowledge through collaborative inquiry and research.	Production of new knowledge

The personal arena. This arena is the context in which teachers enhance their knowledge of self as a professional through interactions mediated by their PLN. Teachers' experiences of linking, stretching, and amplifying are determined by the extent of their interaction and shared personal opinions and feelings (see Table 2). In the personal arena, learning appears more likely to occur through stretching or amplifying. Opening oneself to vulnerability, and sharing personal experiences and aspects of personality, creates the authentic connections where individuals may feel safer to take risks and invite innovation and change (Baker-Doyle, 2017). For example, one participant observed that:

> it (the PLN) makes you feel not alone. And when you don't feel alone as an educator you have the confidence to try new things . . . it's affected me as an educator just giving me that feeling of not being isolated. And as a result, pushing myself.

In the personal arena, teachers who stretch their professional learning offer and receive feedback and advice about their personal experiences of teaching, which enrich and clarify how they see themselves within the teaching profession. For example, some participants said that by sharing their personal thoughts and feelings about teaching, they gained greater self-confidence, openness, and empathy toward others. When teachers amplify their professional learning, they draw on feelings of support and connectedness within their PLN to present themselves authentically, openly sharing their personal reflections and observations with confidence. These teachers demonstrate feelings of agency and capacity to contribute to their profession (Baker-Doyle, 2017).

Table 2

Teachers' Practices in the Personal Arena

Teachers' practices	Ways in which knowledge of self as professional is enhanced	Outcomes
Linking	Placing limits on personal information shared, choosing instead to seek validation through commonality of experience.	Self-confidence Openness to others
Stretching	Engaging through reciprocity, feedback, and advice, expanding sense of self as educator.	Self-confidence Empathy Openness to others Clearer sense of self
Amplifying	Presenting an authentic representation of self across all parts of the PLN. Drawing on sense of support and established relations to experiment and innovate. Openly sharing personal reflections.	Self-confidence Empathy Reflexivity Openness to others Positive sense of self

The public arena. This arena offers a learning context where teachers can contribute to the wider education profession and enhance their professional recognition. Here teachers link, stretch, and amplify by creating content and sharing thoughts and opinions that inform the learning of others within and beyond their PLN (see Table 3). The PLN allows teachers to share expertise publicly, creating the potential for others to see their interests, practice, and expertise in a way that may have not been possible previously (Lieberman & Pointer Mace, 2010).

The high levels of interactivity and contribution that characterise amplifying practices in the public arena underpin professional learning experiences which enhance professional recognition. Participants spoke about rewards which they felt were due in part to their active presence within their PLNs, and the

positive public representation this created. For example, one participant commented that she owed her PLN for enabling opportunities to speak at conferences, present overseas, and that her online profile resulted in her appointment to her current position.

Some participants engaged with linking practices in the public arena by following network stars—teachers who share high quality resources and information regularly with their connections. Participants stretched their learning in the public arena when they increased their levels of interactivity and contributions within their PLN.

Table 3

Teachers' Practices in the Public Arena

Teachers' practices	Ways in which professional recognition is enhanced	Outcomes
Linking	Recognising the professional capital of other individuals within the network. Following 'network stars' to access high quality information and resources.	Access to high quality information and learning experiences from network stars.
Stretching	Developing their reputation within the PLN through increased interactions and contributions.	An increase in the number of individuals becoming connected to them through the PLN. An increase in the influence and/or distribution of contributions made to PLN.
Amplifying	Maintaining a well-established presence within PLN and beyond, based upon an evidence base shared through the PLN. Contributing thoughts and opinions which inform the learning of others.	Greater opportunities for career development. Opportunities to share knowledge and expertise beyond PLN and to promote and advocate for contemporary education in public forums.

Teacher as Learner

The second element of the model relates to teachers as learners. It highlights that teachers who learn as connected professionals share learning attributes which influence their experience of professional learning through their PLN. As outlined below, teachers as connected professionals engage with linking, stretching and amplifying practices which characterise their varying autonomy, participation, and understandings of networked learning. Teachers who learn as connected professionals are active and self-directed, as well as literate within social networks to differing degrees. These attributes represent a networked, connectivist approach to learning, as teachers autonomously navigate their PLN, forming

connections, and making decisions about the quality of the information and resources gathered from diverse sources (Downes, 2010). Interdisciplinary learning opportunities created when teachers leverage the affordances of social technologies to connect and collaborate across geographic and temporal boundaries, create a participatory connected learning environment (Gogia, 2016; Ito et al., 2013).

The autonomous learner. As autonomous learners, teachers link, stretch, and amplify with networks "of their own accord, according to their own knowledge, values and decisions" (Downes, 2010, p. 18). Teachers can autonomously direct their PLNs; however, their learning depends upon how they exercise this autonomy—as choice and control, an expression of self, or both (Ryan & Deci, 2011; Ting, 2015). When linking, teachers can exercise autonomy through choice and control by determining when and how links are made through the PLN. When stretching, teachers use their PLN to create opportunities to express themselves as teachers and learners, as they seek learning of personal interest and direct their network towards their own, rather than their school's goals. When amplifying, teachers pursue learning horizons that are broader than immediate professional needs through their PLN. This was exemplified by some participants who stated their interaction with their PLNs was driven by a love of learning and a passion for education in general. One participant commented that her PLN was "part of who I am and what I enjoy doing."

In summary, teachers experience autonomy within the PLN as:

- choice and control (linking)
- an expression of self as teacher and learner (stretching)
- an expression of self as individual (amplifying).

They exercise their autonomy by:

- making links within the PLN at times and places that most suit the learner, to enhance practice as needed (linking).
- taking advantage of the capacity to tailor and personalise learning – stretching beyond immediate needs to explore broader professional interests (stretching).
- taking advantage of the opportunity to continually expand learning horizons, amplifying learning to meet intrinsic motivations (amplifying).

The participatory learner. Teachers demonstrate a participatory approach when they describe their professional learning as an outcome of actively and openly connecting and interacting with others (Ito et al., 2013; Jenkins, Ito, & boyd, 2016). A participatory approach may vary in intensity through linking, stretching, and amplifying. Teachers who link may manage their network interactivity by limiting the social technologies they use and by linking with fewer people. Teachers who stretch increase their participation by making more contributions and re-distributing information and resources throughout their PLN. Teachers who amplify are highly participatory, engaging in sharing and reciprocity. This enhances their credibility, encouraging trust and confidence (Hegarty, 2015). Examples of highly participatory learners were evidenced by participant observations such as "you

never have that sense of being isolated" and "that feeling of sharing and community that exists within (my PLN)."

In summary, teachers demonstrate a participatory approach by:

- linking with others on an as needed basis, offering advice and seeking support for the immediate resolution of day to day issues (linking).
- building confidence to stretch the number and quality of contributions to the PLN and engaging through consuming and redistributing information and resources (stretching).
- actively participating, through regular sharing of resources and information to amplify learning and collaborating with others to initiate or lead knowledge construction (amplifying).

The networked learner. Teachers who are networked learners understand the social construction of learning, as well as the influence of their connections and the strategies they employ to construct new knowledge (Jones & de Laat, 2016). Teachers who experience professional learning through linking may understand networked learning to be the simple connecting of information between two nodes. They view the PLN mainly as a source of information rather than as an interactive network of individuals. Teachers who stretch their professional learning see the value of dialogue and interaction through networks. They experiment with different ways to share and connect with others through their PLNs. Teachers who amplify their learning demonstrate a networked and connectivist perspective (Jones & de Laat, 2016; Siemens, 2005). They perceive learning not so much as the acquisition of a fixed body of knowledge, but as interaction with others to construct and access content. One participant expressed that through her connections, she felt able to construct personal knowledge, while also elevating collective knowledge: "it's that collective brain, with less and less barriers."

In summary, teachers understand networked learning as:

- direct connections and communications which enable knowledge transfer from one network node to another (linking).
- an increasing number of modes and channels as for dialogue with others in the network (stretching).
- collaboration to develop new ideas and understandings including consultation through multiple connections before actively sharing and promoting learning (amplifying).

The social network literate learner. Social network literacy involves the capacity to critically access, navigate, and make use of social networks for professional purposes, both online and offline (Bridgstock, 2016; Rheingold, 2012). Teachers exhibit different levels of social network literacy when engaging with their PLNs. For teachers who experience professional learning through linking, social network literacy is demonstrated by interactions with intentionally smaller networks, to manage information flow. As teachers stretch their experiences, they explore different platforms, and develop strategies to leverage more diverse connections and information. Stretching practices associated with a growing level of social network literacy were displayed by one participant, who commented that when she saw others sharing inappropriate material online, she became concerned for them, as they may not be aware that "this is trackable, identifiable, potentially career destroying for you if you don't know how

to handle it." Teachers with higher levels of social network literacy amplify learning experiences by moving between online and offline, and across various platforms as needed.

In summary, teachers demonstrate social network literacy when they:

- create direct connections on a limited number of platforms or with smaller networks to manage information flow (linking).
- stretch interactions across different platforms within PLN and develop strategies to collaboratively co-construct knowledge (stretching).
- move between online and offline and various platforms seamlessly and as needed and evaluate activity across the PLN to identify patterns and trends which offer opportunities to amplify learning (amplifying).

Teachers manage their network connections and information within the network by:

- initiating and maintaining fewer connections on an as needed basis and accessing and sharing information of a technical nature (linking).
- working to expand diversity of network connections and developing relations which support reciprocity and trust within the network as well as actively developing strategies to manage information flow (stretching).
- curating their PLN by strategically evaluating potential connections and actively managing information flows using a range of strategies as well as modelling these strategies for others (amplifying).

The PLN

The third element of the model of learning as a connected professional is the PLN. The findings associate this element with two main categories, namely: social technologies and a network of diverse connections. Linking, stretching and amplifying practices are evident through the way teachers perceive social technologies within their PLN, and indicate the extent of diversity within their PLN connections.

Social technologies. As teachers expand their learning contexts to include not only the pedagogical arena, but also the personal and professional arenas, there appears to be a shift from recognising the social technologies as features of the PLN, towards a greater focus on the affordances of the technology. Thus, social technologies become less visible, and more an enabling infrastructure for the PLN. Teachers acknowledge social technologies as a defining feature of their PLN although there is variation in how they use and perceive this technology. This variation falls into two categories: a tool focus, and a people and learning focus (see Table 8). The research findings suggest that teachers who largely engage with linking practices tend to have a greater tool focus, while those who amplify their learning are more likely to have a people and learning focus. The variation was evidenced by participants' maps of their PLNs. Some structured their maps according to the tools they used, while others created maps that did not feature any social technologies, but which were constructed of the names of individuals.

Table 4

Categories of Social Technology Use in PLNs

	Tool focus	People and learning focus
Professional learning practices		
	Mostly linking, some stretching practices.	Some stretching, mostly amplifying practices.
Role of social technology in PLN		
	Social technologies at forefront—provides PLN with structure.	Social technologies largely invisible.
How interaction occurred		
	Tool choice determines mode of interaction.	Interaction determines tool choice.
How learning occurred		
	Learning episodes occur within one social technology tool/platform at a time.	Learning occurs across whatever social technology tool or platform required.

A network of diverse connections. This study shows that although teachers have the potential to connect with and learn from individuals all over the world, their connections are various and diverse (see Table 9). Some participants practiced linking with only a few others, while some participants stretched their learning by creating a wider range of connections. Others used very diverse connections to amplify their learning. For instance, while one participant observed that "a lot of it [interaction] is within the ghetto of the [Education] department" another described an expansive network, listing librarians, educators as well as commentators on popular culture, politics, and social action as sources of connection.

Table 5

Diverse Connections Within the PLN

The PLN is...	Created by connections who are:	Characterised by connections who provide:
Linking	Direct links, from similar contexts or who are teaching within similar roles.	Information and inspiration for current/near future teaching practice.
Stretching	Associated broadly, stretching from any aspect of teaching and education including commercial stakeholders.	Support, feedback, and encouragement in personal interest areas and general teaching experiences.
Amplifying	Amplified to include multi-disciplinary and diverse backgrounds including and beyond teaching and education.	Inspiration and serendipitous discovery of information to enhance the learning experience in general.

Discussion: Implications for the Model of Learning as a Connected Professional

The model of learning as a connected professional has empirical, conceptual, and pedagogical implications. By graphically representing the case study findings, it highlights new understanding about teachers' experience of professional learning through PLNs. It illustrates the complexity of this experience which integrates three key elements—arenas of learning, teacher as learner, and PLN—and involves diverse linking, stretching, and amplifying practices.

As the model indicates, the findings both complement and extend previous empirical research. For example, this study contributes further understanding about how teachers may engage with professional learning mediated through social technologies (Prestridge, 2019; Trust et al., 2016). Like Prestridge's study (2019), this model identifies opportunities for teacher professional learning through social media. While Prestridge identifies variation in teacher types, the present model highlights variation in teachers' practices of linking, stretching, and amplifying, as well as the ways teachers move between these practices according to personal need, desire, and capacity.

As a conceptual contribution, the model reveals a significant interrelationship between networked learning, connectivism, and connected learning. It shows how the attention to context (arenas of learning), the learner, and the PLN expand the notion of knowledge construction, distribution, and redistribution (Haythornthwaite & de Laat, 2012; Jones, 2015). By identifying the influence of diverse connections, interactivity, and autonomy, the model indicates the important role of connectivist principles in teachers' professional learning through PLNs (Downes, 2012). The openly networked nature of PLNs and the active, self-directed, and participatory attributes of teachers learning as

connected professionals embodies the learning and design principles of connected learning (Ito et al., 2013).

From a pedagogical perspective, the model supports the design and implementation of highly accessible professional learning through a PLN. It offers strategic, evidence-based pointers for teachers and professionals who value social learning that is flexible, mobile, and highly relevant to contemporary digitally mediated contexts (Ranieri et al., 2012; Visser et al., 2014). For example, teachers could use the model as a map to explore different learning opportunities, by linking, stretching, and amplifying their practices in new ways across the three arenas.

By raising awareness of the PLN as a conduit for multifaceted learning, the model proposes an innovative approach to professional learning that is empirically and conceptually informed. As the PLN is openly networked, it ensures inclusive learning opportunities that extend to learners who are isolated geographically, or who work remotely.

The model also provides the conceptual foundation for the development of a practice framework to guide educational systems or individuals who wish to initiate or enhance their PLN. The pedagogical potential of the model as a foundation to cultivate connectedness for students in higher education is also a rich area to be explored (Bridgstock, 2016). Future studies are needed to investigate how this model may be interpreted and applied within different professional and educational settings.

Conclusion

This paper has presented a model to enhance teachers' professional learning through personal learning networks. Case study findings of the experiences of 13 teachers, and the framing theories of networked learning, connectivism, and connected learning ensure the authenticity of the model. As a contribution to practice, the model offers teachers a guide for evaluating and extending their professional learning. When teachers experience learning through a PLN, they are no longer isolated teachers but connected professionals, supported by their personal learning networks.

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A Scoping Review of Videoconferencing Systems in Higher Education: Learning Paradigms, Opportunities, and Challenges

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Abstract

Videoconferencing as a learning tool has been widely used among educators and learners in order to induce effective communication between learners and teachers or learners and their peers, especially when face-to-face means are not possible. Different types of videoconferencing platforms or systems have emerged for use in today's higher education institutions. Previous research has focused on examining the potential of three different forms of videoconferencing systems: desktop videoconferencing (DVC), interactive videoconferencing (IVC), and Web videoconferencing (WVC). In this study, a review of the literature was conducted to increase the current knowledge regarding the use of these videoconferencing systems. A classification of the videoconferencing paradigms from the constructivism and cognitivism perspectives was provided. The summary of the results for these videoconferencing systems revealed specific learning opportunities, outcomes, and challenges for both learners and instructors. The results suggest that current policy and teaching strategies are not ready to provide an accessible and comprehensive learning experience in DVC and IVC. Relative to previously conducted studies regarding the use of videoconferencing in higher education, this study offers a broader consideration of relevant challenges that emerge when using certain videoconferencing systems in both learning and teaching situations.

Keywords: computer-mediated communication, distance education, telelearning, improving classroom teaching, lifelong learning

Introduction

The current movement toward creating a comprehensive learning experience via the Internet by most higher education institutions, in both developing and developed countries, appears to be increasing the use of advanced Information and Communication Technology (ICT) in higher education (Al-Samarraie & Saeed, 2018). This movement requires engaging students in a learning space that is compatible with their abilities and surrounding context. In addition, the cognitive nature of a learning task typically demands an effective medium for creating and sharing ideas among group members. Creating a comprehensive learning experience online also requires continuous updating of technology to ensure its integrity for use in delivering instruction. From this, video communications technologies have been used to enable more authentic learner–learner interaction in virtual environments (Reaburn & McDonald, 2017; Smyth, 2011). In higher education, videoconferencing, whether it is accessed via the Web or desktop, is considered one of the most commonly used tools for facilitating learners' self-directed use of technology in a synchronous mode (Fischer, Collier-Meek, Bloomfield, Erchul, & Gresham, 2017; Reese & Chapman, 2017).

Previous studies on the effectiveness of videoconferencing in education have reported that various environmental (e.g., hardware, station, etc.) and individual (e.g., attitude, knowledge, etc.) dimensions influence the learning experience of students (Ghazal, Al-Samarraie, & Aldowah, 2018; Malinovski, Vasileva-Stojanovska, Trajkovik, & Caporali, 2010). Lawson, Comber, Gage, and Cullum-Hanshaw (2010) suggest that individuals' learning experiences can be changed by using different modes or forms of communication within and across different learning environments. In his research, Coventry (1995) demonstrates how videoconferencing can be put into a learning framework by taking a learner-centered rather than technology-centered approach, while also highlighting that institutions must have a clear understanding of videoconferencing capabilities before committing to the use of videoconferencing technology. Thus, the effective use of teleconferencing services can be associated with the technological readiness of an organization (Coventry, 1995). Pitcher, Davidson, and Napier (2000), on the other hand, address the need for exploiting opportunities offered by different videoconferencing systems to facilitate learners' interaction and collaboration. This requires careful modification of the conventional lecturing in order to meet the videoconferencing standards and needs (Pitcher, Davidson, & Napier, 2000). Thus, it is evident that video and audio conferencing are considered as more "complex" communication channels than face-to-face communication (Allen, Bourhis, Burrell, & Mabry, 2002), where learning outcomes expected from using certain types of videoconferencing systems may vary from one context to another based on the available ICT resources (Sife, Lwoga, & Sanga, 2007).

With the use of 'cutting-edge' teleconferencing tools in different educational environments, there is still a notable lack of research to demonstrate the current use of videoconferencing in the higher education of developing and developed countries. Furthermore, previous studies have not sufficiently addressed the specific opportunities and challenges related to the use of different types of videoconferencing systems to the policy makers of higher education, which may promote current efforts for the delivery of effective distance learning experiences. According to Lawson et al. (2010), the impact of videoconferencing on how learners learn and interact may serve certain educational objectives, and therefore videoconferencing must be adapted in certain learning circumstances. Based on these observations, the research study at hand reviewed the existing literature concerning the use of desktop videoconferencing (DVC), interactive videoconferencing (IVC), and Web videoconferencing (WVC) to identify how their use may contribute to the learning of students, as well as to identify the specific

challenges associated with DVC, IVC, and WVC. In addition, a classification of the videoconferencing paradigms from the constructivist and cognitivist perspectives was formulated.

Videoconferencing: An Illustration of Different Types

Videoconference technology is a communication medium that allows connected users to share visual and audio facilities in real time. It also allows registered users to transmit files, slides, static images, and text through the platform being used (such as desktop and Web) (Krutka & Carano, 2016). As the bandwidth availability, networks, and the speed of computers have dramatically increased in developed countries and most developing countries, using videoconferencing has become more feasible and realistic for professional organizations, school districts, and universities. However, even with a high-speed network, using certain videoconferencing systems may imply different experiences in accordance to the usage purpose and environmental conditions.

According to Campbell (2006), interaction between students-to-students and students-to-instructors in videoconferencing environments have opened new opportunities for advancing the delivery of traditional pedagogies. Many instructors use videoconferencing services to promote problem solving development and competency among students and themselves (Lawson, Comber, Gage, & Cullum-Hanshaw, 2010). However, synchronous videoconferencing systems may not necessarily deliver the required set of learning outcomes and an enhanced pedagogy to users, which poses new challenges to higher education (Lewis, O'Rourke, & Dooly, 2016).

For the purpose of the study at hand, we argue that students' exposure to different types of videoconferencing systems may offer different learning experiences and outcomes. Our review of the literature led to the identification of three types of videoconferencing systems (DVC, IVC, and WVC). Figure 1 shows a visual illustration of videoconferencing in its three forms.

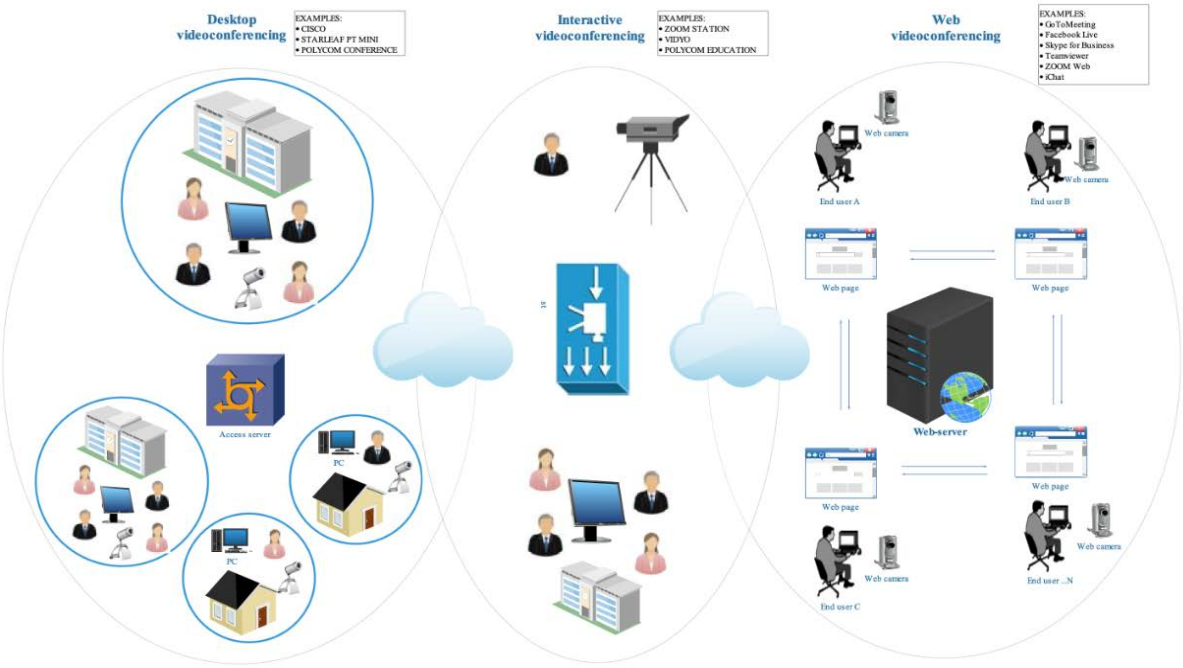

Figure 1. An illustration of different videoconferencing types.

As depicted in Figure 1, DVC (e.g., CISCO, STARLEAF PT MINI, and POLYCOM conference) is a type of videoconferencing which offers a group of people multiple channels of communication to discuss and learn about relevant issues and to solve certain learning problems. DVC supports multiple modes of interaction including: many-to-many, one-to-many, many-to-one, and one-to-one. It also provides a unique advantage to university members by allowing individuals to access and engage in active discussion via specially configured computers (provided by the university) and systems that can be installed and used on their own computers.

Also depicted in Figure 1, IVC (e.g., ZOOM STATION, VIDYO, and POLYCOM EDUCATION) is a type of videoconferencing that requires fixed environmental settings and advanced configuration to maintain the interaction between instructor and students. This type of service supports one-to-many interaction where instructors deliver their courses to the students in real time. It is suitable for conducting classes and trainings in distant locations. Meetings supported by IVC are usually aided by multimedia elements to facilitate the learning and teaching of the subject.

Lastly, WVC (e.g., GoToMeeting, Facebook Live, Skype for Business, Teamviewer, and ZOOM Web) is a type of videoconferencing that allows learners and instructors from different places to participate in Web-based discussions (using interaction modes similar to DVC), and is a particularly popular mean for promoting communication between students and their instructors. The key advantage of WVC is that, unlike when using DVC and IVC solutions, students and other faculty members are not fixed to a certain hardware and software requirements.

In the light of these criteria, university students are commonly perceived to use all three of these communication tools for the purpose of engaging in dialogue and problem solving (Freeman, 1998). However, the current literature does not clearly distinguish the impact of each type of videoconferencing on students' learning in a university context. Thus, we conducted a scoping review of the literature to provide necessary information regarding the learning paradigms, opportunities, and challenges of DVC, IVC, and WVC usage in higher education. Table 1 presents a comparison between DVC, IVC, and WVC from different technical, interaction, and organizational perspectives.

Table 1

Comparison Between DVC, IVC, and WVC Systems

Characteristics	DVC	IVC	WVC
• Requires advanced hardware configuration.	x	X	
• Requires advanced software configuration.	x	X	
• Cost effectiveness.			x
• Requires Internet connection.	x	X	x
• Requires account.		X	x
• Allows file sharing.	x		x
• Enables presentation.	x	X	x
• Provides private access.	x	X	
• Provides public access.			x
• Requires permission to access.	x	X	
• Provides advanced multimedia support.			x
• Requires advanced proxy configuration.	x	X	
• Requires training.	x	X	
• Supports one-to-many interaction.	x	X	x
• Supports many-to-many interaction.	x		x
• Supports one-to-one interaction.	x		x

Method

In this work, we paid special attention to the role of DVC, IVC, and WVC systems in promoting students' learning at the university level. The review was guided by the following research questions: "How can certain videoconferencing types be used to support learning paradigms?" and "What are the learning opportunities and challenges related to the use of these systems?" Figure 2 shows the search and selection flow chart of research articles retrieved from different databases such as ACM, ASSIA, Oxford University Press (journals), Science Direct, EBSCO, PsycINFO, SocINDEX, Emerald, and IEEE.

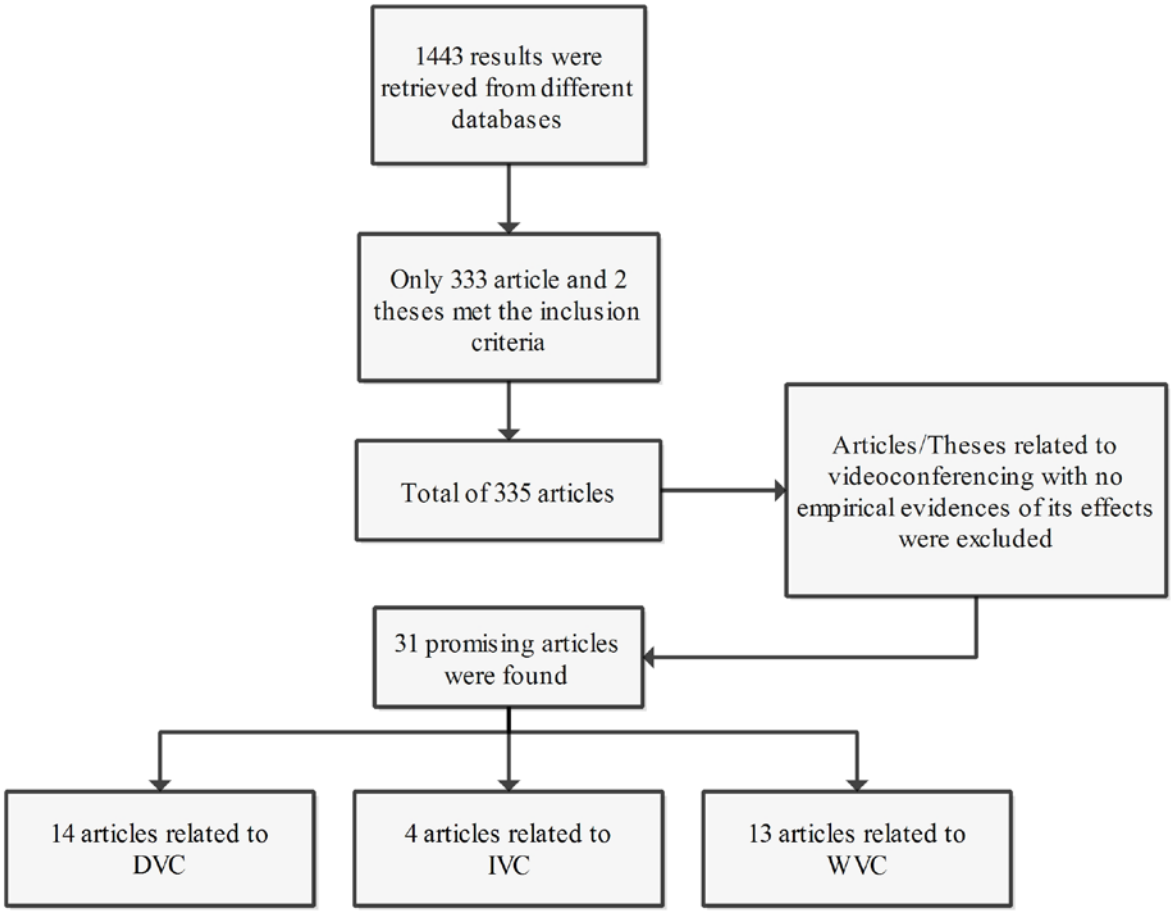

Figure 2. Articles selection flow chart.

The analysis of previous works was based on the recommendations of Srivastava (2007) and followed these steps:

1. Defining unit of analysis: Previous research papers, chapters, and theses on the use of videoconferencing systems in higher education were defined as the unit of analysis in this review. The argument as to why higher education ought to be more concerned with the use of certain videoconferencing systems is mainly to encourage active learner-centered education in hybrid learning environments. This includes the changing learning needs of society and the impact of new technologies on educational policies.

2. Collecting publications: Our literature review focused on English-peer-reviewed journals, since they are the most common resources for information exchange among researchers. Since

videoconferencing in higher education was first officially used 1995, we searched for articles published between the years of 1995 and 2018 and our search included examples of videoconferencing being used in a multitude of learning situations/ circumstances. We used different combinations of keywords to perform the search, such as "videoconferencing in higher education," "desktop videoconferencing in university," "online/Web videoconferencing services," "videoconferencing in distance education/learning," "teleconferencing for learning purposes," "interactive videoconferencing," and "collaborative videoconferencing." We also included more specific terms such as "interactive video communication," "desktop video system," "videoconferencing for distance learning," and "Web video system." A total of 1443 articles were then stored and prepared for further screening and selection. Only empirical studies that investigated the direct impact of the three types of videoconferencing systems on students' learning were included in this review (335 studies). Articles that did not explain the evaluation procedure and use of certain videoconferencing systems were not considered. Other studies that investigated the effect of videoconferencing, supported by other communication or tools such as the Blackboard learning environment, were also not considered. This is because the outcomes that emerged within these studies may not have been purely from the videoconferencing experience itself but instead influenced by the other communication tools used in combination with videoconferencing. We also excluded studies that explored students' general use of videoconferencing in circumstances outside of learning. Out of the 335 articles identified, only 31 articles met the inclusion criteria of the study.

3. Classification context: This review investigated three main schemes: DVC, IVC, and WVC. The 31 articles selected were classified and reviewed according to these schemes.

4. Material evaluation: The overall quality of the 31 studies was assessed by three experienced experts in the educational field, who scored the studies on a scale of 1-3 (low-high) based on: 1) appropriateness of the method, 2) relevance to the context of focus, and 3) credibility and validity. We measured the weight of each study by summing scores of each of the three dimensions. Then, we performed the inter-rater reliability (r) test which resulted in 0.91 agreement between the experts. Ultimately, all the 31 articles were found to fulfil this study's criteria and focus (see Figure 2).

Results

The results of the comparison between different studies on videoconferencing use in higher education are presented in Table 1. Below is a description of these studies according to the type of videoconferencing system used.

Table 2

A Review of Studies About Videoconferencing Use in Higher Education

No	Study	Description	Subjects	Tool
1	Sankar, Ford, and Terase (1997)	Demonstrated the effect of using videoconferencing technology in class.	85 MIS students	DVC
2	Harman and Dorman (1998)	Investigated the potential of videoconferencing as a tool for supporting distance learning.	15 math students	DVC
3	Fillion, Limayem, and Bouchard (1999)	Compared the effect of videoconferencing versus conventional classroom-based approaches on students' perceptions of lecture context.	55 university students	DVC
4	Chisholm, Miller, Spruill, and Cobb (2000)	Examined the effects of videoconferencing on students' academic performance and instructors' teaching evaluations.	26 pharmacy students	IVC
5	Townsend, Demarie, and Hendrickson (2001)	Examined the effect of students' anticipated system utility on videoconferencing satisfaction, and in turn, on their workgroup performance.	64 university students	DVC
6	Reiserer, Ertl, and Mandl (2002)	Investigated the effect of different videoconferencing scenarios on the learning outcomes of peer dyads.	86 university students	DVC
7	MacLaughlin, Supernaw, and Howard (2004)	Compared outcomes of distance education using interactive videoconferencing vs on-site education in pharmacotherapy courses.	78 university students	IVC
8	Wang (2004)	Determined whether videoconferencing can be used as a tool for supporting oral and visual interaction in distance education.	7 university students	WVC
9	Kidd and Stamatakis (2006)	Compared students' performance and satisfaction among medical students when using videoconferencing and live classroom.	38 pharmacy students	IVC
10	Ertl, Fischer, and Mandl (2006)	Explored how to support the collaborative learning activity in videoconferencing.	159 university students	DVC
11	Bertsch, Callas, Rubin, Caputo, and Ricci (2007)	Compared the use of videoconferencing and in-person lectures in preparing medicine students for clinical practice examinations.	52 medical students	IVC
12	Xiao (2007)	Investigated the effects of interaction with native speakers via videoconferencing on learners' language proficiency.	20 language students	WVC
13	Lee (2007)	Studied the potential of videoconferencing in developing second language oral skills.	18 language students	WVC

14	Gillies (2008)	Investigated students' views of the perceived effectiveness and value of videoconferencing.	27 university students	WVC
15	Giesbers, Rienties, Gijselaers, Segers, and Tempelaar (2009)	Investigated the effect of videoconferencing on students' expectation and satisfaction to communicate and learn online.	82 university students	WVC
16	Stewart, Harlow, and DeBacco (2011)	Studied the effect of videoconferencing on learners participating in multi-site, graduate-level education classes.	18 university students	WVC
17	Hampel and Stickler (2012)	Investigated the effect of videoconferencing on learners' interaction and communication.	7 university students	DVC
18	Florit, Montaño, and Anes (2012)	Evaluated relative efficacy, in terms of academic performance, of videoconferencing in teaching accounting.	630 accounting students	DVC
19	Britt, Hewish, Rodda, and Eldridge (2012)	Investigated the potential of videoconferencing to deliver interprofessional clinical education.	724 medical students	DVC
20	Fitzsimons and Turner (2013)	Reported the potential of collaborative project-based learning in videoconferencing.	6 university students	DVC
21	Giesbers, Rienties, Tempelaar, and Gijselaers (2013)	Examined the potential of videoconferencing tools in promoting students' performance based on their level of motivation, in an online course.	110 university students	WVC
22	Hortos, Sefcik, Wilson, McDaniel, and Zemper (2013)	Compared the effectiveness of using videoconferencing and attending live lectures on students' academic achievement.	275 medical students	DVC
23	Nilsen, Almås, and Krumsvik (2013)	Compared students' perception about on campus lectures and videoconferencing.	56 teacher education students	WVC
24	Jung (2013)	Investigated how learners can develop their linguistic competence via videoconferencing.	45 linguistic students	DVC
25	Jorgenson, Wilby, and Taylor (2016)	Investigated the potential of videoconferencing to promote cultural competency among students.	110 pharmacy students	DVC
26	Eiland, Garza, Hester, Carroll, and Kelley (2016)	Examined students' learning outcomes when engaging in a team-based session.	35 pharmacy students	DVC
27	Saito and Akiyama (2017)	Examined the impact of videoconferencing on the longitudinal development of second language production.	30 students	WVC
28	MacLeod, Kits, Mann, Tummons, and Wilson (2017)	Investigated how the use of videoconferencing can facilitate students' communication with lecturers.	30 students	WVC

29	Haug (2017)	Compared students' interactions when discussing learning topics via face to face and videoconferencing.	8 students	WVC
30	Kubota (2017)	Explored how videoconferencing can promote students' collaboration at a distance.	12 junior students	WVC
31	Oka and Suardita (2018)	Examined dental students' perceptions of videoconferencing lectures on basic/clinical research.	248 dental students	WVC

Videoconferencing Systems and Learning Paradigms

Understanding how certain technologies can be informed by the existing learning paradigms, such as constructivism and cognitivism, is essential for educational policy makers, as it allows them to enhance students' learning experience through the redesign of existing hybrid instructional models (Mallon, 2013). Therefore, a detailed review of the literature on how videoconferencing systems have been used to fulfill the learning goals of these paradigms is necessary. An illustration of the videoconferencing paradigms from the constructivist and cognitivist perspectives is shown in Figure 3.

The perspective of constructivist approach to knowledge construction and learning, we believe, can be well supported with the use of videoconferencing through a variety of collaborative learning tasks, interaction and reflection, and problem-solving conditions, which can offer the field of distance education alternative student-centered approaches to teaching and learning in hybrid courses. These constructivist activities in DVC and WVC can replace the traditional student-teacher-model of distance instruction, which consists of working with a limited number of classroom environments and tools in order to support the knowledge construction process. In addition, DVC and WVC can support student's interpretation of a learning problem through providing students the opportunity to engage in various learning activities. Instructors can use these videoconferencing systems to accurately assess the actual teamwork process and contribute to the construction of knowledge by interacting with students to help them reflect on their response to the learning task and to the learning environment. The supportive communication provided in DVC can offer some great pedagogical values such as sharing, presentation, and file transfer for learners to create external representations of theoretical concepts, evidence, and personal elaborations.

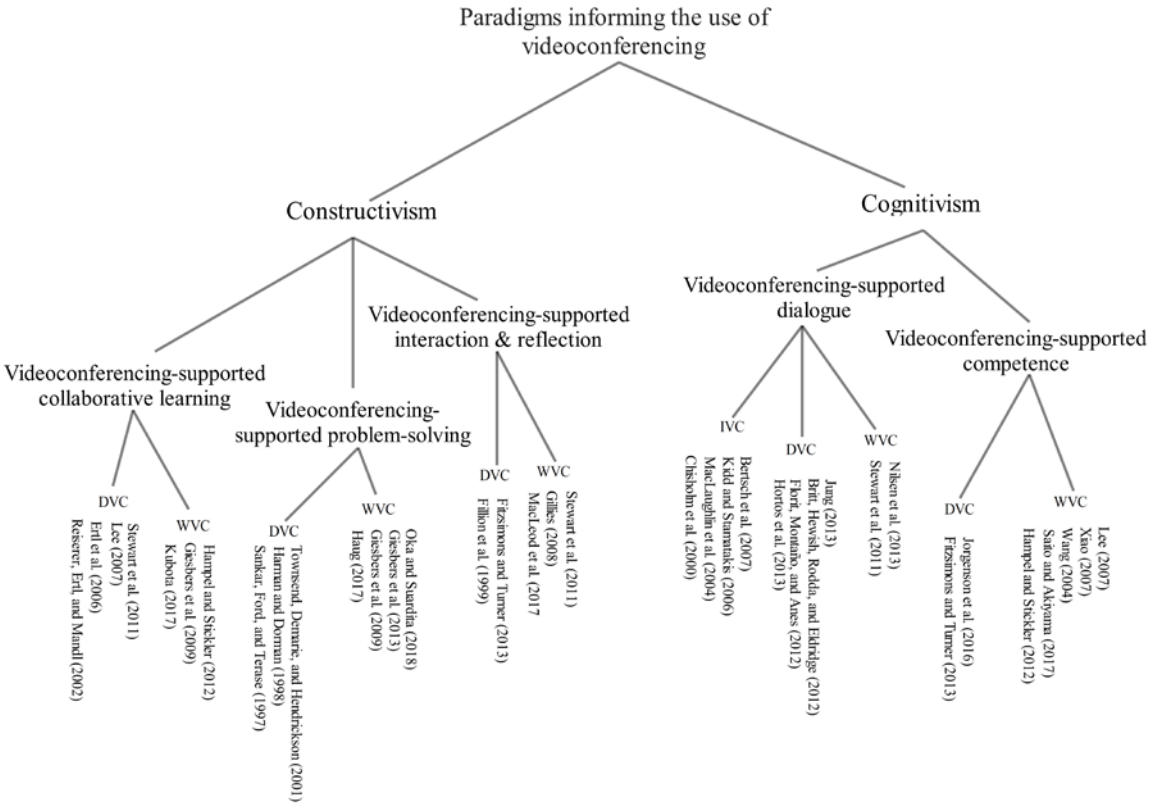

Figure 3. Videoconferencing paradigms.

From the cognitivist perspective, DVC, IVC, and WVC can be used to facilitate individuals' acquisition of information and knowledge from others by providing additional dialogue activities as a means of developing dialogue skills. This includes facilitating the development of the encoding process of learning materials that might facilitate later transfer. These systems can also be used to provide the means for students to transfer knowledge in the most efficient, effective manner possible by providing the necessary feedback to resolve ambiguities. The provision of additional dialogue activities for information recall demonstrates the potential value of interaction in these videoconferencing systems as well as improve information encoding and retrieval. IVC can be used to support effortless elaboration on a subject and the development of lesson content using the students' responses (MacLaughlin, Supernaw, & Howard, 2004), which could both increase the recall of information and make the information more meaningful. Both DVC and WVC can provide authentic learning opportunities that take place when a student communicates with the instructor online, thus promoting the acquisition of knowledge. DVC and WVC may also allow and encourage students to make connections with previously learned material by facilitating the recall of prerequisite skills and use of relevant resources.

Opportunities and Challenges of DVC, IVC, and WVC

Based on the review of previous studies (see Table 2), the major learning opportunities that emerged from the use of DVC, IVC, and WVC are discussed below. Major challenges regarding the use of these systems are also addressed to help educational decision makers understand the different technical, individual, and organizational factors that may impact learning through videoconferencing.

Desktop videoconferencing (DVC). Our review of the literature revealed that the majority of previous studies used DVC mainly to promote knowledge development and attitude-related outcomes. For example, Fillion, Limayem, and Bouchard (1999) stated that DVC sessions can be used to increase students' motivation and satisfaction of the course. In the context of linguistics, Lee (2007) found that speakers' linguistic variations were mostly affected by their degree of interactivity in the DVC session. Jung (2013) reported that the constant use of DVC has the potential to develop students' language competence by promoting participation in cross-cultural communication. In their research, Fitzsimons and Turner (2013) suggest that DVC can promote students' participation in collaborative project-based learning by engaging students in the process of problem-solving and allowing them to effectively apply theory to practice. DVC has been recognized as a system which can provide the means for students to generate a wider range of voices, as well as to allow them to record meetings and ask questions freely (Nilsen, Almås, & Krumsvik, 2013). DVC can also be used to facilitate progressive development in cultural competency among students coming from different backgrounds (Jorgenson, Wilby, & Taylor, 2016).

However, some challenges of DVC were also reported in the literature. For example, Hampel and Stickler (2012) suggest that in DVC, interaction is often limited due to only one person usually being allowed to speak at a time, which may thus impact turn-taking and back channeling, as well as lead to interruptions. Hortos, Sefcik, Wilson, McDaniel, and Zemper (2013) stated that the main challenges of using this DVC in learning include difficulties related to the design of meeting rooms and lack of built-in microphones. They found that students who learned in DVC settings performed no differently than those who attended live lectures (Hortos, Sefcik, Wilson, McDaniel, & Zemper, 2013). In addition, Ertl, Fischer, and Mandl (2006) observed no effect of DVC on learners' outcomes in collaborative learning settings, as students found it difficult to make use of the relevant support strategies for expressing themselves freely during the discussion. Meanwhile, students' contribution to the discussion or

problem-solving session was improperly distributed among themselves (Ertl, Fischer, & Mandl, 2006). In light of these observations, it can be deduced that DVC effectiveness for higher education teaching and learning still need be further explored.

Interactive videoconferencing (IVC). Previous studies (Chisholm, Miller, Spruill, & Cobb, 2000; MacLaughlin et al., 2004) have used IVC to promote students' academic performance. These studies claimed that using IVC can provide students with a close-up viewing and direct interaction with the instructor, as compared to the Web and desktop types (Chisholm et al., 2000; MacLaughlin et al., 2004). However, some studies perceived IVC to be inconvenient for learning complex knowledge. For example, Kidd and Stamatakis (2006) claimed that students' performance and satisfaction with IVC were lower than that of those who learned in a classroom setting. Considering various behavioral and environmental elements, Bertsch, Callas, Rubin, Caputo, and Ricci (2007) showed no significant differences in students' achievement when participating and interacting in IVC sessions compared to regular classroom lectures. It appears that the use of this type of videoconferencing system is less preferred than attending the usual classroom.

This can be attributed to the various challenges that IVC may impose on students' learning, which include creating uncertainty and fear among learners that, as a result, may induce misunderstandings among group members. MacLaughlin, Supernaw, and Howard (2004) added that instructors in the IVC session are required to constantly modify their teaching techniques, which may prove distracting for students and thus decrease the effectiveness of IVC. Furthermore, it is difficult for students and instructors to conduct regular scheduled recitation-type sessions with this type of communication (Kidd & Stamatakis, 2006). Other problems related to technical setup and bandwidth stability can also affect the quality of communication (both audio and visual) in IVC and thus negatively impact teaching and learning.

Web videoconferencing (WVC). WVC, as compared to DVC and IVC, appears to provide a more promising learning environment for students to freely collaborate and communicate effectively through different interaction channels. Most previous studies (e.g., Basiel & Howarth, 2011; Hatzipanagos, Basiel, & Fillery-Travis, 2010) considered this type of communication to be relevant to students' learning of various topics. As articulated by Gillies (2008), WVC allows students to participate in live interaction with the tutor and share relevant questions as well as exchange arguments in peer-to-peer discussions. In the WVC session, students are more likely to be motivated, because they can simultaneously collaborate with other members using audiovisual communication tools in an activity stream (Gillies, 2008). Although the use of WVC may often lead students to interrupt each other, this type of communication can still play a major role in enhancing learning effectiveness and efficiency through the facilitation of dynamic collaborative effort among group members (Stewart, Harlow, & DeBacco, 2011). Previous studies have also noted the potential of WVC to serve as an assessment tool for directing students' communication, which, may increase their sense of autonomy, competency, and relatedness, and thus help them to persist in their engagement (Giesbers, Rienties, Tempelaar, & Gijselaers, 2013). WVC can also be used to facilitate the exchange of ideas during a collaborative effort with regards to geographical placement of team members (Basiliko & Gupta, 2015).

Despite these opportunities, several issues were also noted when using WVC in the university context, such as time delay, background noises, and other technical hitches that may influence learners' interaction (Gillies, 2008). Students may face difficulties in maintaining their concentration when the focus is on another site and where the speaker is not visible on the screen (Lee, 2007). Giesbers,

Rienties, Gijselaers, Segers, and Tempelaar (2009) criticized the use of WVC due to compatibility issues found when students attempt to configure their machines. Still, the majority of previous studies are still dominated by the effectiveness of the WVC system to provide exceptional support for students to establish communication and social presence in collaborative learning sessions. A summary of the major learning outcomes reported in the reviewed studies describing the use of DVC, IVC and WVC is presented in Table 3.

Table 3

Learning Outcomes Reported in the Studies Associated With the Use of DVC, IVC, and WVC

Learning outcomes	DVC	IVC	WVC
Knowledge-related outcomes			
Problem-solving skills	*		
Performance	*	*	
Achievement		*	
Understanding	*		*
Knowledge			*
Attitude-related outcomes			
Attitude	*		
Perception	*		
Motivation	*		
Autonomy	*		
Satisfaction	*	*	
Communication-related outcomes			
Interaction	*		*
Sharing			*
Fluency			*
Accuracy			*
Confidence			*
Competence	*		

Discussion and Conclusion

The review of the literature revealed that there tends to be possible differences in learning outcomes when students learn through different videoconferencing systems. The opportunities and challenges of using videoconferencing systems in higher education (see Table 4) are summarized as follows:

1. Learning opportunities offered by DVC include: providing students the opportunity to exchange ideas and resources in a collaborative environment, promoting second language competency and performance. Although most previous studies did not find significant differences between students taking DVC and usual classroom, DVC is still considered to provide some exceptional opportunities for language and medical students. It was also found to advance cultural exchange and understanding among students from different racial/ethnic groups and educational establishments. This is due to its role in promoting socio-cognitive processes and structured interfaces that can help to develop students' sense of enjoyment, critical thinking, and autonomy. Challenges implied by this type of communication are more formidable, as reflected by previous studies. Using DVC in higher education still requires further investigation, especially regarding certain environmental effects on students' ability to establish the common

sense to solve learning problems and transfer the necessary support strategies throughout the learning session. In addition, the common challenges associated with students' interaction in DVC are derived from the difficulty in handling linguistic variations, turn-taking, interruptions, and back channeling.

2. The direct interaction with the instructor offered in the IVC environment was found to facilitate students' performance and achievement. Previous studies highlighted the potential of using this technology to help students learn from a close-up viewing with regards to geographical distribution of the instructor. Although IVC enables students to learn from a close-up view, the impact of this close-up view on students' learning was minimal. This can be attributed to the learners' uncertainty and fear to take part in the discussion.

3. WVC offer students and instructors the freedom and flexibility to learn and teach at their own pace. This was mostly reflected by the way in which WVC allows group members to assign roles to one another in their discussions, which is assumed to encourage dynamic cooperative efforts among group members. However, students who are not technology-oriented may be confronted with technical hitches and machine incompatibility. Meanwhile, the constant monitoring of students' progress throughout the session is the key for ensuring a meaningful learning experience in WVC. Such experience would greatly increase students' confidence and interaction to engage in live learning practices, which may enhance their understanding of complex and challenging topics.

This study anticipated that current policy and teaching strategies are not ready to provide an accessible comprehensive learning experience in DVC and IVC. From a policy perspective, this is probably because DVC and IVC are generally considered not cost-effective as they require experience to operate, and well-designed environments in order to establish a meaningful interaction among group members and the instructor. As such, more efforts are needed to determine the key antecedents for creating a comprehensive experience in videoconferencing environments. Future studies may still need to consider examining certain cognitive and behavioral factors when students engage in IVC and DVC sessions, and how they may be associated with the students' learning outcomes and motives for communicating with other group members and instructors. Finally, additional primary research is needed to further justify how certain learning outcomes can be achieved from the use of certain types of videoconferencing systems.

Table 4

Major Learning Opportunities and Challenges of DVC, IVC, and WVC Reported in the Studies

Learning opportunities			Challenges		
DVC	IVC	WVC	DVC	IVC	WVC
• Promote cultural competency. • Generate a wider range of student voices. • Stimulate professional activities and applies theory to practice. • Provide multiple modalities and pedagogical support. • Provide socio-cognitive support and structured interfaces.	• Allow for close-up viewing.	• Provide reliable means to assess individual's role in the discussion. • Promote dynamic collaborative efforts. • Allow students to engage in live interaction with the tutor.	• Availability of the system, ease of use, room location and layout, training issues, cost, and compatibility. • The stability of the Internet connection. • Require pre-knowledge to foster collaborative knowledge construction. • Learners may face difficulties to transfer support strategies of the learning unit. • Turn-taking, interruptions, and back channeling may affect the interactivity. • Difficulties to develop problem solving skills.	• Create uncertainty and fear as it lacks regularly scheduled recitation-type sessions. • Require trained instructors and constant modification of teaching techniques.	• Individual may experience technical hitches and machine incompatibility. • Students may often unintentionally interrupt each other. • Require constant modification of teaching techniques.

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Approach to M-learning Acceptance Among University Students: An Integrated Model of TPB and TAM

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Abstract

A growing number of higher education institutions have adopted tools to promote mobile learning. However, studies into the driving factors of its adoption are insufficient. This article identifies the aspects that have an effect on the adoption of mobile learning (m-learning) among university students. The theory of planned behavior (TPB) and technology acceptance model (TAM) have been shown to be valid and powerful models in the research on the adoption of learning technologies. Based on TPB and TAM, we propose a model to explain how perceptions influence m-learning adoption among Colombian university students. To confirm the acceptability of the model, a self-administered questionnaire was applied to 878 undergraduate university students from the Instituto Tecnológico Metropolitano (ITM), a higher education institution in Colombia. The results suggest that all of the constructs of TPB and TAM have a moderate impact on the intention to adopt m-learning. Specifically, perceived usefulness and attitude have a significant influence on students' acceptance of m-learning. These results can stimulate future research and promote an effective diffusion of m-learning in developing countries.

Keywords: mobile learning, adoption factors, TPB, TAM, university students

Introduction

Education is key to social and economic change. However, for higher education students, there are problems of coverage, relevance, and methodology in the educational process. This is where new information and communication technologies, as well as the development of applications for mobile devices, have generated extraordinary changes not only in education, but also in society (El-Hussein & Cronje, 2010).

Consequently, educators have sought to use mobile technologies to facilitate the learning process among students and to create new innovative learning opportunities (Jeng, Wu, Huang, Tan, & Yang, 2010). New mechanisms have emerged, such as mobile learning (m-learning), one of the most useful tools in the adoption and appropriation of information and communication technologies (ICT) in learning processes. m-learning seeks to include the requirements of mobility, accessibility, and interactivity that traditional teaching mechanisms lack. Although this type of learning has multiple advantages and has evolved rapidly in different places around the world, studies that analyze the driving factors of m-learning adoption are limited (Sarrab, Al Shibli, & Badursha, 2016), especially in emerging economies.

This article therefore examines key factors and variables in the process of acceptance and use of m-learning by students of the Instituto Tecnológico Metropolitano (ITM) through the application and verification of the theory of planned behavior (TPB) and the technology acceptance model (TAM). The descriptive research is presented through a quantitative methodological design (self-administered questionnaires). The results verify the explanatory capacity of the TPB and TAM for evaluating the incidence of each factor in the level of acceptance of this new technology among university students.

Theoretical Background

Mobile, Open, and Distributed Learning

The use of ICT has dynamically changed the way human groups interact among themselves. One of these changes has occurred in the education context due to mobile technology use. It is important to note that mobile technology directly affects students' learning process and creates innovative learning opportunities (Jeng et al., 2010). In fact, technological advances have allowed the development of open and distributed learning (Downes, 2017), and driven learning initiatives like mobile learning to improve educational outcomes (Akinwamide & Adedara, 2012).

Mobile devices are widely used to support open and distributed learning (Aghaee, Jobe, Karunaratne, Smedberg, Hansson, & Tedre, 2016). m-learning is full of promise and offers thrilling opportunities (Brown & Mbati, 2015) and has reduced study restrictions in terms of time and space (Adebayo, 2010), as well as allowing free access for all (Moreno-Agudelo & Valencia-Arias, 2017).

As noted by Kukulska-Hulme (2010) "learning is open to all when it is inclusive, and mobile technologies are a powerful means of opening up learning to all those who might otherwise remain at the margins of

education" (p. 184). A new era of distributed learning is therefore being established with the progressive development of machine learning in mobile devices (Bach, Tariq, Mayer, & Rothermel, 2017).

The literature also shows that information systems for mobile and open learning provide the user with an autonomous learning experience (Cao & Li, 2013; Díez-Echavarría, Valencia, & Cadavid, 2018). As a result, open, technology-based education is moving from being simply an opportunity to a necessity in the education landscape. Students must develop digital skills in order to adequately respond to future challenges (Ossiannilsson, 2015). For this reason, teachers should take advantage of available methodologies in order to meet the demands of the global era and respond appropriately to these social changes (Cadavieco, Goulão, & Costales, 2012).

With the use of mobile technologies, it can be argued that students are not passive agents, but are rather able to pursue activities with greater motivation and interest than with traditional processes (Ozdamli & Cavus, 2011). Mobile technologies also influence the lives of individuals by connecting them with various sources of information, and by providing learners with independence in terms of location and time (Vinu, Sherimon, & Krishnan, 2011). As a result, the use of m-learning changes many educational dynamics of the past into new dynamics based on communication between people and access to information (Gong & Wallace, 2012).

The term m-learning defines the practices that use mobile devices and wireless data transfer technologies to promote and extend the reach of teaching and learning processes (Pardo & Balestrini, 2010). m-learning, combined with a virtual educational environment, is one of the tools derived from mobile technology and Web 2.0. This new educational mechanism has several advantages, including personalization of learning experiences, which allows students to choose the device, place, and time that best fit their learning pace and needs. m-learning also improves the design of instructional environments that promote experiences according to the student's reality (Depetris, Tavela, & Castro, 2012).

The use of mobile devices in the classroom has great educational possibilities because they encourage and stimulate the development of basic skills. m-learning promotes a more atomized organization of content, similar to that obtained with learning objects (Ramírez, 2007, cited by Cataldi & Lage, 2012). Mobile technologies can also provide access to education for students normally excluded by reason of location, social status, or technological infrastructure (Serbanescu, 2010).

A greater understanding of how students perceive and react to the use of virtual learning tools is therefore required. This will allow the creation of mechanisms to attract more students to enter these virtual environments; the success of virtual learning systems depends on their acceptance and use by students (King & He, 2006).

Technology Adoption Models

One issue that has received special attention in the research on m-learning tools is the analysis of the factors that influence students to adopt these technologies (Cheon, Lee, Crooks, & Song, 2012). This includes the exploration of the primary predictors of students' intention to use virtual learning tools (Valencia-Arias, Chalela, & Bermúdez, 2018). There have been different proposals and models that incorporate the most relevant dimensions in the process of adopting mobile devices within the classroom.

Two behavioral theories have been widely applied to investigating the use of technological tools. One is the theory of planned behavior (TPB; Ajzen, 1991), which concerns how behavioral intentions are formed to act. The other is the norm activation model (Schwartz, 1977) and its successors, which explain how personal rules are activated and determine pro-social behavior. There have been numerous empirical studies based on models of m-learning adoption, such as: (a) Hamidi and Chavoshi (2018), who predict the impact of mobile phone use in higher education; (b) Al-Hunaiyyan, Alhajri, and Al-Sharhan (2016), who explore the many challenges that affect the implementation of mobile devices in learning; and (c) Spiegel and Rodríguez (2016), who also incorporate socializing constructions to determine the requirements for technologies becoming a teaching support tool. The common characteristic of these and other relevant studies is that behavioral intent is treated as the most predictive and proximal predictor of behavior. That is to say, no mediator was introduced between behavioral intent and the effective behavior.

Among these approaches, research based on the beliefs and attitudes of individuals acquire singular relevance, and in particular, those based on TPB (Schifter & Ajzen, 1985). This theory aims to explain the behavior of individuals on the basis of the belief–attitude relationship and intention behavior. It is an extension of the theory of reasoned action (TRA) (Sampedro, Fernández-Laviada, & Herrero, 2014). TPB has been widely used to analyze behaviors as diverse as the acceptance of the World Wide Web, the adoption of mobile technologies, and the use of online services (Herrera & Fennema, 2011).

Figure 1 shows an outline of TPB for an individual. According to this model, an individual's behavior is determined by the intention to perform the particular behavior. This intention is a function of attitude, subjective norms, and perceived behavioral control, which go back to attitudinal, normative, and control beliefs, respectively. More explicitly, intention describes the force of the purpose for performing a particular behavior, while attitude represents the individual's positive or negative feelings about the performance of the particular behavior (Fishbein & Ajzen, 1975). Subjective norms can be seen as the social pressure that individuals perceive to perform a certain behavior. Finally, perceived behavioral control refers to the perception that people have about the ease or difficulty of performing the behavior (Ajzen, 1991).

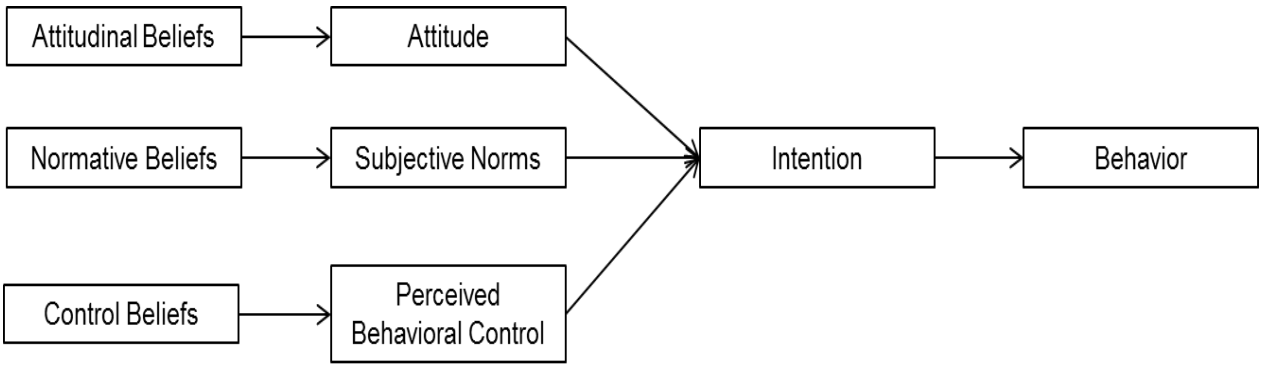

*Figure 1***.** Theory of planned behavior model. From "The theory of planned behavior", by I. Ajzen, 1991, *Organizational Behavior and Human Decision Processes, 50*(2). Copyright 1991 by Academic Press Inc.

Cheon et al. (2012) propose specific antecedents to subjective norms and the control of perceived behavior in the context of m-learning. First, they argue that subjective norms are determined by normative beliefs that explain the influence of others' expectations on an individual's intention. Due to the divergence of opinions that may exist among groups of individuals, it is suggested that normative beliefs can be decomposed into different referent groups (Taylor & Todd, 1995). In this sense, the most relevant referent groups in the educational field are students and instructors (Taylor & Todd, 1995), so they propose the readiness of students and readiness of instructors as antecedents of the subjective norms, as shown in Figure 2.

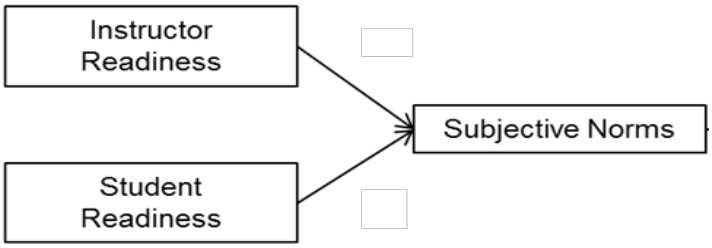

*Figure 2***.** Subjective norms antecedents. From "An investigation of mobile learning readiness in higher education based on the theory of planned behavior", by J. Cheon, S. Lee, S. M. Crooks, and J. Song, 2012, *Computers & Education, 59*(3). Copyright 2012 by Elsevier Ltd.

Second, perceived behavioral control depends on "beliefs about the presence of factors that may favor or hinder the performance of behavior" (Ajzen, 2002, p. 665). Thus, two fundamental concepts are associated within the beliefs of control: perceived self-efficacy and learning autonomy, as shown in Figure 3. Bandura (1997, cited by Cheon et al., 2012) defines self-efficacy as the perception people have of their abilities and motivations in carrying out specific tasks. Learning autonomy, which refers to the extent to which individuals have sufficient control of their learning process (Yeap, Ramayah, & Soto-Acosta, 2016), has also been shown to be an antecedent of control beliefs.

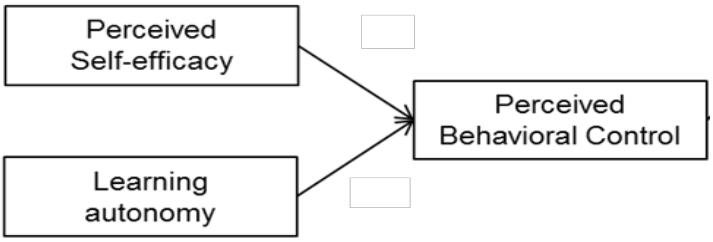

Figure 3. Perceived behavioral control antecedents. From "An investigation of mobile learning readiness in higher education based on the theory of planned behavior", by J. Cheon, S. Lee, S. M. Crooks, and J. Song, 2012, *Computers & Education, 59*(3). Copyright 2012 by Elsevier Ltd.

Several studies on the adoption of technologies have been based on TAM, introduced by Davis (1986), and a variation of the TRA that is focused on the adoption of new technologies. TAM tries to explain the behavior

from intention, showing that attitudes lead to intentions, which in turn generate behaviors (Herrera & Fennema, 2011).

As illustrated in Figure 2, TAM establishes causal relationships between perceived usefulness, perceived ease of use, attitude towards the use, and current use of technology (King & He, 2006). Perceived usefulness refers to the extent to which an individual considers that the use of a particular system will improve his or her performance in an activity, whereas the perceived ease of use is the extent to which a potential user expects the use of the technology will not involve great effort (Herrera & Fennema, 2011). Shin and Kang (2015) comprehensively tested factors considered by TAM and demonstrated that students at online universities have begun to use mobile technology as a learning tool, which has improved their learning performance.

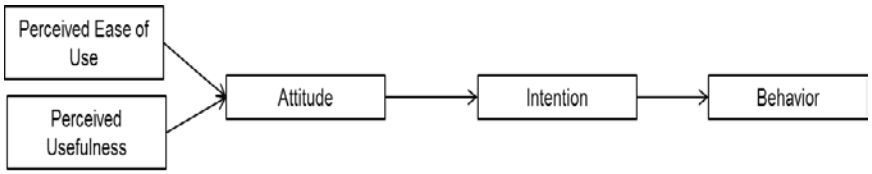

Figure 4. Technology acceptance model (TAM). From *A technology acceptance model for empirically testing new end-user information systems: Theory and results* (Doctoral dissertation), by Davis, 1986, Cambridge, MA: Sloan School of Management, Massachusetts Institute of Technology. Copyright 1986 by the Massachusetts Institute of Technology.

It is important to emphasize that while TPB is a general theory, designed to explain almost any human behavior (Herrera & Fennema, 2011), TAM focuses exclusively on the use of technological innovations and a priori seems more appropriate for analyzing this type of behavior (Davis, 1989).

Park (2009) discusses the importance of analyzing what determines whether students accept or reject virtual learning tools. The different points of view that have emerged on the subject of m-learning suggest that it is relevant to know the opinion of those who have become users, especially students. Many studies have therefore been carried out, such as Gong and Wallace (2012), who identified a series of deficiencies in the academic context, although respondents in general saw m-learning positively. One of the perceived deficiencies is that use of mobile devices concentrates more on entertainment than on education. Many still believe that mobile devices can affect students' concentration and increase the tendency for plagiarism. Therefore, there are still challenges that must be faced in the development of m-learning.

It appears that the new teaching models are based on a constructivist view of learning, where the flow of knowledge in the classroom is increasingly multidirectional. In this sense, it is evident that the new technologies are instruments that can contribute to the acquisition of knowledge, with students continuing to learn outside the classroom (Duarte & Arteaga, 2010). However, there are several obstacles to consolidating the use of instructional technology into higher education, including technological infrastructure, teacher effort, and user satisfaction (Surry, Ensminger, & Haab, 2002). This translates into difficulties for the achievement of successful strategies in terms of acceptance of m-learning.

The increasing reliance on information systems and the vertiginous introduction of new technologies in learning environments means that the identification of critical factors related to user acceptance of this technology becomes an important research problem (Park, 2009). We therefore propose using TAM and TPB as tools to evaluate these technological introduction processes in the educational field in an emergent economy. By limiting the framework of this study to ITM students, we seek to understand student perceptions of m-learning, as well as the factors of use and adoption of this technology. This will permit us to identify key variables in the development of pedagogical processes that are more in line with new social demands and facilitate the acquisition of knowledge.

Research Model and Hypotheses

The model presented in Figure 3 is proposed as the research model, based on constructs related TPB, TAM, and the model proposed by Cheon et al. (2012).

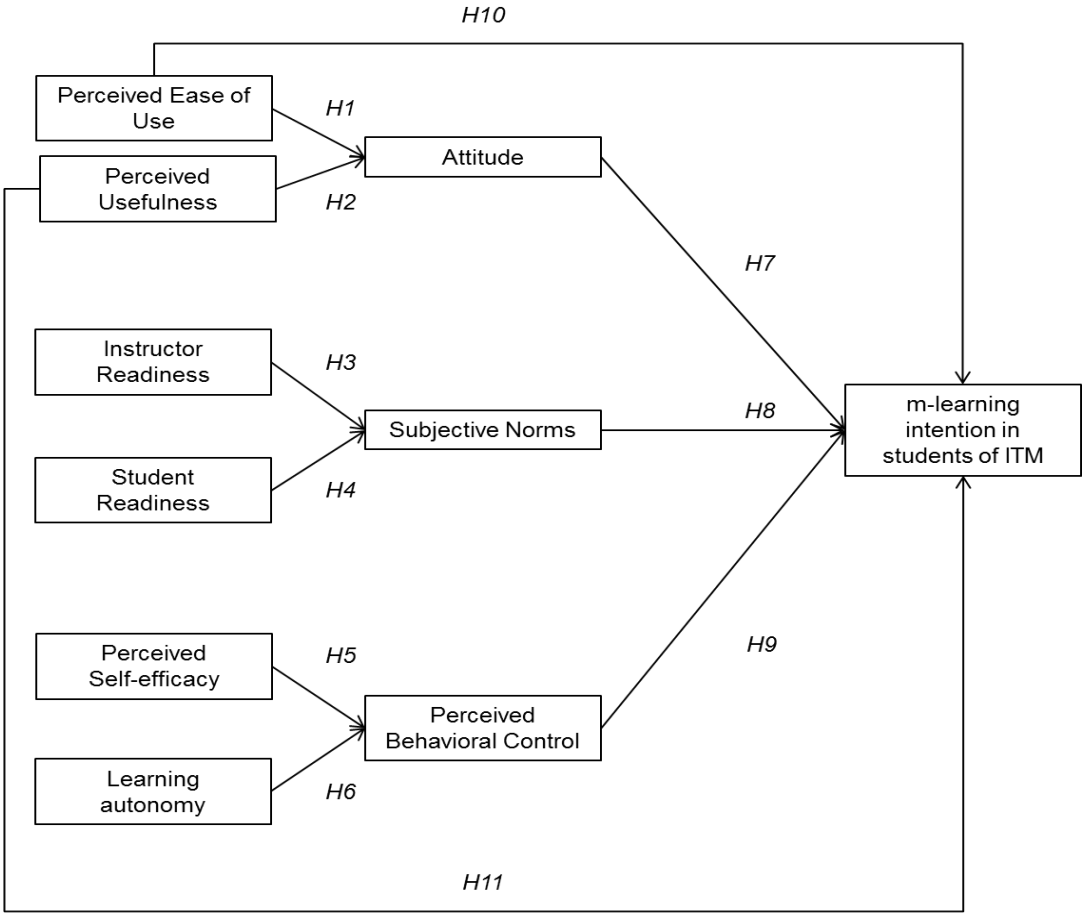

Figure 5. Research model.

It should be clarified that, despite taking as reference point the work developed by Cheon et al. (2012), our article contributes to knowledge from two points. First, concepts can only be understood within the context

of their time (Wallerstein, 2011). In that sense, a different temporal horizon between that approached by Cheon et al. and our research produces a different frame within which to understand concepts. Second, although few perspectives are entirely new, novelty may appear in the first serious application of that perspective within a particular context (Wallerstein, 2011). Specifically, there are noticeable differences between developed countries and Colombia that affect the population's behavior and perceptions with respect to areas such as quality of life, education, and others. Therefore, we explore students' behavior in an emergent country to complement the notions and perspectives of preliminary studies conducted with students from developed countries. Subsequently, the following hypotheses were developed:

H1: ITM students' perceived ease of use of m-learning positively influences their attitude toward m-learning.

H2: ITM students' perceived usefulness of m-learning positively influences their attitude toward m-learning.

H3: ITM students' perceived instructor readiness for m-learning positively influences subjective norms for m-learning.

H4: ITM students' perceived peer student readiness for m-learning positively influences subjective norms for m-learning.

H5: ITM students' perceived self-efficacy toward m-learning positively influences their behavioral control with m-learning.

H6: ITM students' perceived learning autonomy toward m-learning positively influences their behavioral control with m-learning.

H7: ITM students' attitude toward m-learning positively influences their intention to adopt m-learning.

H8: ITM students' subjective norms toward m-learning positively influence their intention to adopt m-learning.

H9: ITM students' perceived behavioral control toward m-learning positively influences their intention to adopt m-learning.

H10: ITM students' perceived ease of use of m-learning positively influences their intention to adopt m-learning.

H11: ITM students' perceived usefulness of m-learning positively influences their intention to adopt m-learning.

According to Venkatesh, Morris, Davis, and Davis (2003) attitude towards behavior is associated with the affective reaction of an individual when using a system, and it can take different nuances depending on the perception experienced by the user. The first of these reactions is part of grading the idea of using the system

on a favorable scale (Davis,1989); the second evaluates the level of wisdom (Fishbein & Ajzen, 1975); the third question regards the level of taste; and finally the fourth analyzes the level of liking for technology (Taylor & Todd, 1995). Hypotheses number one, two, and seven fit within the narrative of these authors and their theoretical and experiential verifications. We consider also subjective norms (Ajzen & Driver, 1992) which, according to researchers, means that the majority of people who are important in the life of a person exposed to the action approve of participation in that action (hypotheses three, four, and eight).

Methodology

Sample

University students were the target group of the study because most current m-learning systems are focused on them. The sample was selected based on a non-probabilistic method and consisted of undergraduate students at the Instituto Tecnológico Metropolitano, a public higher education institution in Medellin, Colombia. At this higher education institution, students represent a variety of demographic profiles and degree programs. Therefore, the responses collected from the students provide a holistic and pluralistic view, taking into account a range of disciplines and perspectives from learners in finance, engineering, computer science, business and management, among others. We then analyzed their responses in light of the distinctions between the humanistic and scientific perspectives established by Snow (1993) in his theory of the two cultures, which is a novel aspect of our research. Other studies about m-learning, such as Cheon et al. (2012), only explore the behavior of students enrolled in courses of computer science and information technologies, which is a limit in the scope of their research.

A total of 878 responses were collected. Approximately 52% of respondents were male and 48% were female. Ages ranged between 17 to 55 years, with 66% in the 18 to 25 years old group. Respondents' academic majors included different areas of knowledge. About 93% of the sample had access to a mobile device or devices (81% of the respondents used smartphones with Internet access and 12% used a different Web-enabled mobile device) and around 87% used such devices to support the learning process. The demographic profile of the sample is shown in Table 1.

Table 1

Demographic Profile of the Sample

Characteristics	Frequency	Percent
Gender		
Male	460	47.6
Female	418	52.4
Age		
Below 18 years	3	0.3

18–25 years	581	66.2
26–33 years	215	24.5
34–40 years	37	4.2
Above 40 years	24	2.7
Age not specified	18	2.1
Mobile device		
Smartphone with Internet access	710	80.9
Other mobile device	104	11.8
No device	64	7.3
Mobile device used for learning		
Always	203	23.1
Usually	267	30.4
Sometimes	292	33.3
Rarely	59	6.7
Never	57	6.5

Survey Instrument and Data Collection

The self-administered questionnaire was designed to assess the research model and collect data. The questionnaire was adapted from the examined instrument in Cheon et al. (2012). The questionnaire consisted of two sections. The first included questions about general information related to gender, age, degree program, as well as access to mobile devices and their use for learning purposes (see Table 1). The second section consisted of 25 items measuring the 10 constructs of the research model. A five-point Likert-scale was used and ranged from 1 for “strongly disagree” to 5 for “strongly agree.”

The questionnaire was piloted to verify the content and, based on that pilot, we made modifications to clarify the questions. Data collection was then carried out in writing; the questionnaire required approximately 15 to 20 minutes to complete. Students filling out the questionnaire were provided with a brief introduction on m-learning and the purpose of the research project. Participants filled it out based on their own perceptions. A total of 878 students answered, and there were no invalid responses.

Data Analysis

In the measurement model, both convergent and discriminant validity were tested through analysis using the Statistical Package for Social Science (SPSS) software. The convergent validity of the model was evaluated on two levels: the reliability of the observable items and the reliability of the constructs (Calvo, Martínez, & Juanatey, 2013). When an item factor loading is greater than 0.6, this is considered evidence that the model is reliable (Bagozzi & Yi, 1988). The reliability of constructs refers to the degree to which an observable variable reflects a factor, and those constructs with a value greater than 0.7 are considered acceptable (Hair, Anderson, Tatham, & Black, 2001).

With the data collected, a standardized factor load of more than 0.6 was obtained for all constructs, which indicates that the model is reliable. The average obtained from loads on each of the indicator factors was greater than 0.7 for all constructs, which indicates the presence of convergent validity as shown in Table 2.

Table 2

Convergent Validity

Construct	Indicators	Standardized factor loadings	Standardized factor loadings average
Perceived self-efficacy	PS1	0.765	0.765
	PS2	0.755	
	PS3	0.775	
Perceived ease of use	EU1	0.822	0.822
	EU2	0.822	
Attitude	AT1	0.859	0.859
	AT2	0.859	
Perceived usefulness	PU1	0.812	0.830
	PU2	0.827	
	PU3	0.85	
Subjective norms	SN1	0.717	0.719
	SN2	0.722	
	SN3	0.718	
Intention	INT1	0.894	0.894
	INT2	0.894	
Learning autonomy	LA1	0.839	0.813
	LA2	0.814	
	LA3	0.785	
Behavioral control	BC1	0.815	0.815
	BC2	0.815	
Instructor readiness	IR1	0.593	0.716
	IR2	0.744	
	IR3	0.812	
Student readiness	SR1	0.786	0.786
	SR2	0.786	

It should be clarified that prior to performing the above calculations, Bartlett's sphericity test and the Kaiser-Meyer-Olkin (KMO) measure of sample adequacy were calculated to determine the suitability of data for carrying out the analysis. The first of these is a statistical test that detects the presence of correlation

between variables; its *p* must be lower than the critical level 0.05 (Manzano, Navarré, Mafé, & Blas, 2011). Similarly, the KMO measure is defined as an index that compares the magnitudes of the correlation coefficients observed with the magnitudes of the partial correlation coefficients, and returns values between 0 and 1. Because in the proposed model Bartlett's values were lower than 0.05 and the KMO coefficient was greater than 0.5, we can affirm that there are significant correlations between the variables.

Discriminant validity refers to the notion that each factor must represent a different dimension: that is, each observable variable must be loaded to only one factor (Ratchford, 1987 cited by Lévy, Martín, & Román, 2006). This is checked by validating "whether the confidence interval around the correlation estimate between the two factors includes 1.0" (Anderson & Gerbing, 1988, p. 416). Figure 6 shows that all cases possess discriminant validity.

	PS	EU	AT	PU	SN	INT	LA	BC	IR	SR
PS	-									
EU	[0.445;0.557]	-								
AT	[0.404;0.521]	[0.403;0.514]	-							
PU	[0.412;0.526]	[0.381;0.501]	[0.542;0.635]	-						
SN	[0.373;0.486]	[0.296;0.425]	[0.375;0.492]	[0.405;0.518]	-					
INT	[0.419;0.534]	[0.384;0.511]	[0.502;0.605]	[0.559;0.653]	[0.431;0.550]	-				
LA	[0.449;0.554]	[0.447;0.563]	[0.605;0.691]	[0.539;0.636]	[0.409;0.525]	[0.578;0.678]	-			
BC	[0.390;0.513]	[0.304;0.433]	[0.364;0.487]	[0.293;0.420]	[0.374;0.489]	[0.418;0.536]	[0.407;0.524]	-		
IR	[0.257;0.384]	[0.306;0.432]	[0.335;0.458]	[0.386;0.502]	[0.373;0.493]	[0.381;0.503]	[0.428;0.538]	[0.346;0.469]	-	
SR	[0.284;0.417]	[0.264;0.405]	[0.362;0.485]	[0.400;0.513]	[0.407;0.521]	[0.465;0.578]	[0.459;0.576]	[0.224;0.355]	[0.358;0.482]	-

Figure 6. Discriminant validity for the measurement model.

The reliability of the measurement scale was determined by Cronbach's alpha. This procedure is necessary because the Cronbach's alpha "is an index used to measure the reliability of the internal consistency of a scale, that is, to evaluate the magnitude in which the elements of an instrument are correlated" (Oviedo & Campo-Arias, 2005, p. 575). Churchill (1979; cited by Manzano et al., 2011) recommends a value higher than 0.70. As shown in Table 3, the measurement instrument's scale appears to have adequate reliability because all Cronbach's alphas are higher than 0.7.

Table 3

Reliability of the Measurement Scale

Construct	Cronbach's alpha
Perceived self-efficacy	0.825
Perceived ease of use	0.841
Attitude	0.879
Perceived usefulness	0.885
Subjective norms	0.778
Intention	0.910
Learning autonomy	0.870
Behavioral control	0.830
Instructor readiness	0.769
Student readiness	0.804

Consequently, the results of the analysis indicate the presence of a factorial model to analyze the acceptance and use of m-learning by ITM students. Moreover, the convergent validity, discriminant validity, and reliability of the measurement scale shows that the instrument includes the principal variables that have a direct or indirect influence on the adoption and use of m-learning.

Results

Following the statistical analysis, the proposed model of adoption of m-learning by the ITM students was estimated by measuring the degree of association in the hypotheses with Somers' D statistic. This corresponds to a measure of association between two ordinal variables that takes a value between −1 and 1, where values close to 1, in absolute value, indicate a strong relationship between the two variables and values close to zero indicate that there is little or no relationship between the two variables (Kaplan, 2000). Because Somers' D is a measure of directional association, it was used in the test of the proposed model. The results obtained for each hypothesis are presented in Table 4, and Figure 7 shows the graphical description of associations of the research model.

Table 4

Degrees of Association in the Research Model

Hypothesis	Somers' D
H1: Perceived ease of use → Attitude	0.429
H2: Perceived usefulness → Attitude	0.565

H3: Instructor readiness → Subjective norms	0.373
H4: Student readiness → Subjective norms	0.410
H5: Perceived self-efficacy → Behavioral control	0.432
H6: Learning autonomy → Behavioral control	0.417
H7: Attitude → Intention	0.502
H8: Subjective norms → Intention	0.479
H9: Behavioral control → Intention	0.463
H10: Perceived ease of use → Intention	0.415
H11: Perceived usefulness → Intention	0.578

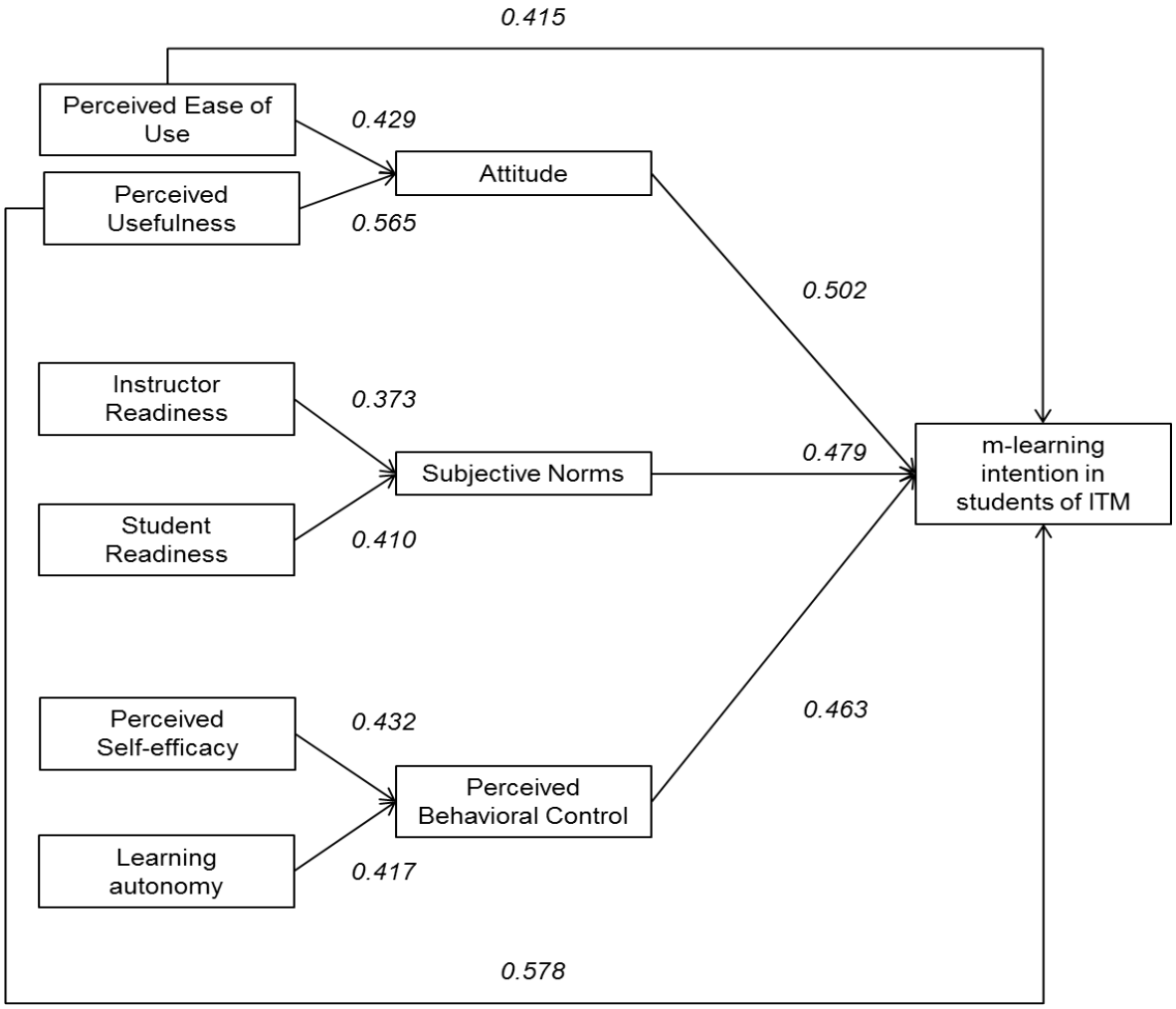

Figure 7. Degrees of association in the research model.

Figure 7 shows that for TPB attitude (0.502), subjective norms (0.479), and perceived behavioral control (0.463), there is an association with intention to use m-learning in ITM students. Specifically, attitude has the closest relationship, followed by subjective norms, and then perceived behavioral control. In terms of TAM, perceived usefulness has a higher association with intention than does perceived ease of use, and it is also the construct with the highest value and an important association with attitude. Perceived usefulness has both a direct and an indirect impact on the m-learning intention of ITM students. This is consistent with the findings of Huang, Hsiao, Tang, and Lien (2014), who noted that perceived usefulness and subjective norms could be connected with m-learning intention.

In general, the strongest relationships corresponded to hypotheses two, seven, and eleven, with a Somers' D of 0.565, 0.502, and 0.578, respectively. The other hypotheses had intermediate relationships between observable and latent variables, with the weakest association occurring between instructor readiness and subjective norms.

Discussion

The analysis of theoretical frameworks in m-learning intention lead to the conclusion that pedagogical dynamics and didactic approaches should be implemented in the classroom based on students' vision for and evaluation of the mobile devices.

Irina Bokova, the former Director-General of UNESCO, has said that pedagogical practices must be transformed according to current needs and argues that the way we conceive education must fundamentally change. Now more than ever, education has a responsibility to promote the right kind of skills, attitudes, and behaviors that lead to sustainable and inclusive growth. The Agenda 2030 for Sustainable Development encourages us to conceive of comprehensive and integrated responses to the many social, economic, and environmental challenges we face. This means going beyond our traditional boundaries and creating effective intersectoral partnerships and alliances (UNESCO, 2016).

The new generation's practical relationship between play and work through the use of technology cannot be ignored. According to the results we obtained, the perceived usefulness of mobile devices for learning processes has an important impact on intention to use. It is therefore necessary to ensure that these processes generate cognitive, playful, and tangible benefits to students in both the long and short term.

One should consider that the development of tools that provide significant advantages to promote m-learning would directly influence the acceptance of those tools. As with perceived utility, ease of use is also perceived as having a direct influence on the acceptance of m-learning.

It is possible that the information circulating in the virtual environment, and to which students have access, can block the learning process because students do not know how to categorize the information that is required. This issue is related both to the personal dimension in the use of technology for learning, understood as the attitude factor, where not only is respect for information necessary, but also a sense of responsibility for the source, whether that is research, a video, or an image.

Although the attitude factor had the greatest influence on acceptance, it was not the only influential factor, because it was found that the subjective norms also possessed a similar degree of influence. This clarifies that both instructor and student preparation can be nearly as much a of determinant as can attitude or the control of perceived behavior.

In this sense, the various possibilities that the virtual space offers (from the point of view of didactic aids) and from the offer of information from other academic spaces cannot be ignored. In both models, this coincides in the valuation of the time, the discipline, and the rational use of the technological mediator. This demonstrates the coexistence that must exist in autonomous learning, highlighting the interactive possibilities that facilitate the teacher–student approach in unplanned projects and spaces.

Conclusions

Despite the increase in the use of mobile devices among students, cultural differences in teaching practices and current social tendencies are key factors for the acceptance and use of this technology. Higher education institutions must develop a policy of institutional transformation because only interconnected structures that involve their employees in the planning, control, and improvement of their operations are essential in order for institutions to be competitive in an environment of constant change. Consequently, it is increasingly necessary to emphasize the importance of the human factor within universities, including the application of models that defend the philosophy that the organization is a human group, a collective.

This study used TAM and TPB to analyze the driving factors related to m-learning intention. It validated that the integration of both models constitutes a fundamental tool when identifying and analyzing the factors, variables, and relationships that inhibit or motivate processes of technological introduction in the educational field in emerging countries such as Colombia.

The proposed model incorporated not only the positive or negative evaluation of an individuals' performance of an individual's behavior, but also the social pressures and benefits of performing or not performing such behavior. This revealed a bigger picture based on the large amount of information collected, while also presenting adequate levels of association for each of the hypotheses.

The adoption of mobile technologies has generated a profound transformation of the university and has affected processes and operations, as well as organizational structures, by presenting new concepts of management. Higher education institutions are therefore called to align the functional structures through which they operate with a mobile education policy in line with their administrative and operational capacity available and culture.

The model can be explained as follows: increasing the degree of favorability of the observable variables will increase the likelihood that there will be greater intention to use m-learning by the students. When presenting adequate margins of association between the related variables, it is correct to say that the model meets the objective set in the research.

The results provide a greater understanding of factors that affect m-learning and should be taken into account in the application of new m-learning initiatives. In developing countries, m-learning also has immense potential and offers new opportunities compared to traditional methods of education. It is therefore necessary for new educational paradigms to include all key factors of the process of technology adoption in devising strategies for the successful dissemination of m-learning in these countries.

M-learning has moved the educational space from the classroom to the screen of a mobile device. This decentralization is the challenge to face when designing teaching-learning processes that take advantage of this virtual space and optimize the communication and didactics on a specific topic. Curricular content and didactic support should stimulate the user to continue learning through research, socialization, as well as deepening knowledge through other learning tools.

Beyond the technical difficulties, an even more significant aspect of m-learning adoption lies in identifying how to approach institutional transformation in higher education; the importance of integrating new and

more agile tools of communication, information dissemination, and knowledge transmission will only be possible when institutions clarify and understand the organizational landscape that defines them. Moreover, recognizing the importance of technology in academic life requires that institutions support the strategic decisions related to m-learning at all managerial levels, which will send the appropriate message to the other institutional axes.

Acknowledgments

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Enjoyment and Not Competence Predicts Academic Persistence for Distance Education Students

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Abstract

Dropout rates of distance education students is a serious problem for many distance education institutions as well as their students. A psychological factor that is related to dropout is the academic persistence of students, or their intent to finish their degrees. One factor that could predict academic persistence, which is often used to identify and help at-risk students, is the academic competencies of students. However, another factor that could predict persistence is the intrinsic motivation of students, or whether they enjoy their academic work and find it interesting. In the present study, 350 distance education undergraduates in South Africa completed a survey that measured their persistence, perceived academic competence, and intrinsic motivation. The survey also measured experienced workload, help-seeking attitudes, and general stress. Results show that intrinsic motivation was a significant predictor of persistence while competence was not. Further, help-seeking attitudes and general stress had indirect effects on persistence through intrinsic motivation. The study highlights the need for educators to be aware of the intrinsic motivation of distance education students, and the factors that could impact it, in order to increase the academic persistence of students.

Keywords: distance education, dropout, academic persistence, intrinsic motivation, competence

Introduction

Distance education has been described as a modern way of providing education that can serve a more diverse and traditionally underrepresented population of students (e.g., Thistoll & Yates, 2016). At the same time, dropout rates among distance education institutions can be problematically high (de Hart & Venter, 2013; Simpson, 2013). One factor that contributes to dropout is whether students want to persist with their degrees and the academic tasks that are involved (Pascarella & Terenzini, 1980).

Academic persistence can be affected by a number of factors. One factor found to predict academic persistence, in research with non-distance education students, is the perceived competence that students have regarding their own academic skills (Hardre & Reeve, 2003; Lavigne, Vallerand, & Miquelon, 2007). Perceived competence refers to the view of oneself as being efficacious in meeting the challenges of the academic environment, completing and keeping up to date with readings and assignments, and being satisfied with one's academic performance (Hardre & Reeve, 2003).

In addition, overt measures of competence such as grades and GPA have also been found to predict persistence, as well as dropout, for both distance and non-distance education students (Aragon & Johnson, 2008; Harrell & Bower 2011; Millea, Wills, Elder, & Molina, 2018; Simon, Aulls, Dedic, Hubbard, & Hall, 2015). As such, it is understandable why educators and school counselors often focus on monitoring grades in order to identify at-risk students, and on skill development as a way of helping at-risk students stay enrolled and to complete their degrees (Simpson, 2008).

Another factor that can predict academic persistence, however, is whether students are intrinsically motivated to continue with their studies. Intrinsic motivation has been defined as a desire to engage in a task because it is inherently enjoyable or interesting, and it has been identified as an important predictor of academic outcomes for both distance and non-distance education students (Deci & Ryan, 1985; Pilkington, 2018; Ryan & Deci, 2000).

Prior research has found a correlation between intrinsic motivation and academic persistence for high school students and non-distance education college students (Lerdpornkulrat, Koul, & Poondej, 2018; Vallerand, Fortier, & Guay, 1997). Whether intrinsic motivation predicts persistence for distance education undergraduate students, however, has not been investigated.

The main purpose of the present study was to assess how perceived competence and intrinsic motivation would each predict persistence when included in the same model (see Figure 1). A number of studies with non-distance education students have been conducted that included both of these factors or similar constructs. For example, studies involving high school students found that both perceived competence and intrinsic motivation predicted academic persistence (Hardre & Reeve, 2003; Lavigne et al., 2007). In addition, a study with non-distance education junior college students found that positive emotions in class (e.g., enjoyment, happiness) and GPA both predicted academic persistence when included in the same model (Simon et al., 2015).

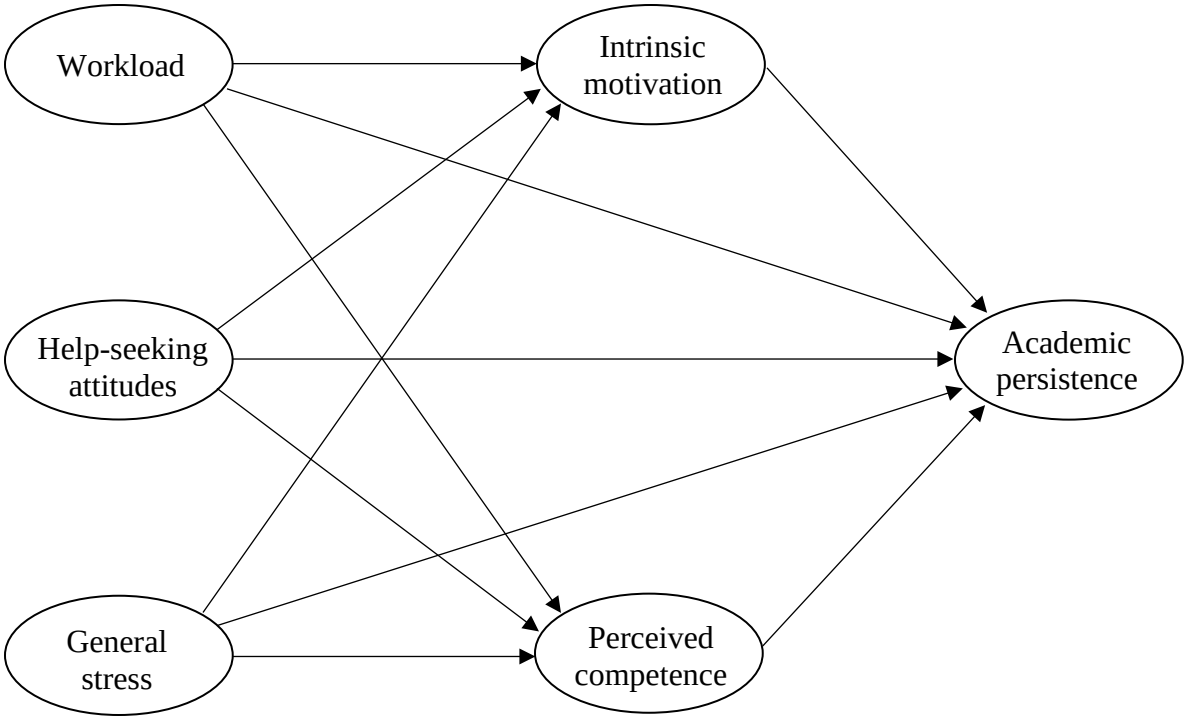

Figure 1. Proposed model.

However, this line of research has not been conducted with distance education undergraduate students, and there is a frequent reliance on competence assessment to identify at-risk students in distance education programs (Simpson, 2008). It was therefore important to conduct a study with distance education students in order to test the relationship between intrinsic motivation and academic persistence, while also including student views of their academic competence.

The present study not only tested if intrinsic motivation and perceived competence predicted persistence, but it also investigated academic workload, help-seeking attitudes, and general stress to see how these factors might predict intrinsic motivation, perceived competence, and academic persistence. Workload, help-seeking attitudes, and general stress may be particularly relevant to distance education students for a variety of reasons. For example, distance education students may be returning to school and may have additional life responsibilities (Jaggars, 2014; Thistoll & Yates, 2016). They may therefore find the additional academic workload and their general stress to be problematic and to have a negative impact on their intrinsic motivation and their perceived abilities to complete academic work. Moreover, they might experience difficulties in accessing help from fellow students and university staff, which could likewise affect their motivation and competence.

It has also been found that students who enroll in distance education programs often do so because of the convenience and flexibility it offers in terms of balancing academic studies with employment and family responsibilities (Hart, 2012; Jaggars, 2014). However, prior research has also found that a commonly reported reason for dropping out of distance education programs is that the academic workload, in the end, was too great (Aragon & Johnson, 2008; Willging & Johnson, 2009). These studies not only focused on dropout but also used qualitative designs and analyses. A quantitative test of whether workload is related

to the motivation, competence, and persistence of currently enrolled distance education students has not been conducted.

Help-seeking attitudes could also be a relevant factor in predicting the intrinsic motivation, perceived competence, and academic persistence of distance education students. Receiving assistance from peers, tutors, and faculty have been found to improve the skills and competencies of non-distance education students (Mayet, 2016; McGhie & du Preez, 2015; Thomas & Thomas, 2018). In studies with distance education students, it has been found that students who sought help also performed better academically (Taplin, Yum, Jegede, Fan, & Chan, 2001), that mentoring may improve retention (Boyle, Kwon, Ross, & Simpson, 2010), and that helpful feedback from instructors can improve academic persistence (Hart, 2012). However, not all students seek help. For example, some students may see help seeking as a reflection of inadequacy, as a threat to self-esteem, or as something to be socially concerned about (Ryan & Pintrich, 1997). The present study looked at the help-seeking attitudes of students and tested whether they were related to motivation, competence, and persistence.

Finally, the general stress of students was also included in the present study. As previously mentioned, distance education students can sometimes be in the position of needing to balance employment, family, and academic studies (Hart, 2012; Jaggars, 2014) yet may lack the opportunity to talk with fellow students in similar situations due to the nature of distance education. Specific sources of stress reported by distance education students have not only included jobs and family relationships, along with school related stressors, but also finances, health, and overall time pressures (Kampfe et al., 2006; Silinda & Brubacher, 2016). As such, the general stress that is experienced by distance education students might be related to their intrinsic motivation regarding their academic studies, as well as to their perceived competence, and finally to their academic persistence. These relationships have not been tested previously for distance education undergraduate students.

The present study used a cross-sectional survey design and was conducted with distance education undergraduates in South Africa. The data was analyzed using structural equation modelling. Workload, help-seeking attitudes, and general stress served as the independent variables. Intrinsic motivation and perceived competence were mediating variables. Academic persistence was the outcome variable.

Method

Participants and Procedure

Undergraduate students at a distance education university in South Africa participated in the study voluntarily. The study was online, and 388 students read an online description of the study. Of those who read the description, 350 completed the survey and formed the sample. The sample was 53% female. The racial distribution was 58% Black, 28% White, 8% Coloured, and 6% Indian (applying racial categories currently used in South Africa). For the university as a whole, the student population was 65% female, and 72% Black, 15% White, 6% Coloured, and 7% Indian. Therefore, compared to the student population, the

sample was proportionally low for females and Black students (University of South Africa, 2016). However, females and Black students still formed the majority of the sample.

The sample ranged in age from 22-years-old to 70-years-old (M = 33.08, SD = 8.32). Regarding faculty, the distribution was 31% Economics and Management Sciences, 25% Human Sciences, 19% Law, 13% Science, Engineering and Technology, 6% Accounting, 4% Agriculture and Environmental Sciences, and 2% Education. At the time of data collection, 14% were in their first year of enrolment, 13% in their second, 18% in their third, 16% in their fourth, 30% in their fifth, 7% in their sixth, and 2% in their seventh.

Ethics approval for the study was granted by a university institutional review board. Data collection occurred during the middle of the second semester of the academic year.

Materials

Academic persistence. The academic persistence of students was measured with the following three items: "I intend to continue studying in my field," "I intend to get a Bachelor's degree in my field of study," and "I am sure that I would like to continue with my education in my current field of study." The items were based on work by Toker (2010). Responses were provided on a 5-point scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .79.

Intrinsic motivation. The intrinsic motivation and enjoyment that students had for their studies was measured with three items. The items were "I really enjoy studying at university," "I am enjoying my academic work," and "I really feel I am wasting my time in university" (reversed scored). The items were taken from a study by Muller and Louw (2004). Responses were provided on a 5-point scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .70.

Perceived academic competence. Perceived competence was measured with the following three items: "I am satisfied with the level at which I am performing academically," "I have been keeping up to date with my academic work," and "I prepare for my assignments regularly." The items were based on performance questions from the Student Adaptation to College Questionnaire (SACQ) developed by Baker and Siryk (1984). Responses were measured with a 5-point scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .70.

Workload. The amount of academic work, as experienced by the students, was measured using three items. The items were "The volume of work in my studies is too high," "Too much is expected of me from my courses," and "The academic work that is assigned is too difficult." The items were drawn from Muller and Louw (2004). Responses were given using a 5-point scale that ranged from "strongly disagree" to "strongly agree." Cronbach's alpha for the scale was .69.

Help-seeking attitudes. The attitudes of students about asking for help were measured using four items. The items were "Getting help in my academic work would be an admission of my own lack of ability," "I would rather fail on my own than succeed in university because I got help," "I would feel uneasy about what people would think if they found out I needed help in order to succeed," and "If I needed tutoring, I would prefer that my professors not find out." The items were taken from a study by Karabenick and Knapp (1991). Responses were provided on a 5-point scale that ranged from "strongly disagree" to

"strongly agree." All items were reversed scored so that higher scores indicated an openness toward seeking help. Cronbach's alpha for the scale was .78.

General stress. The stress of students was measured using the following four items: "In the last month, how often have you felt stressed?" "In the last month, how often have you felt that things were not going your way?" "In the last month, how often have you felt that you were on top of things?" (reversed scored) and "In the last month, how often have you been angered because of things that happened that were out of your control?" The items were taken from the Perceived Stress Scale by Cohen, Kamarck, and Mermelstein (1983). Responses were given on a 5-point scale with the following labels: "never," "rarely," "sometimes," "often," and "very often." Cronbach's alpha for the scale was .76.

Results

All variables were first tested for univariate normality in order to determine if parametric statistical analyses could be used. To check for normality, skewness and kurtosis were assessed. For each variable, the skewness and kurtosis were both between -2 and 2, which indicated that each variable was normally distributed (Field, 2009).

The purpose of the present study was to assess how intrinsic motivation and perceived academic competence predicted academic persistence. Further, the study also looked at how workload, help-seeking attitudes, and general stress predicted intrinsic motivation, perceived competence, as well as persistence. Therefore, in order to test these relationships, structural equation modelling was used with workload, help-seeking, and stress as independent variables, intrinsic motivation and perceived competence as mediator variables, and academic persistence as the outcome variable (see Figure 2; see Table 1 for descriptive statistics and for Pearson product-moment correlations).

Table 1

Means, Standard Deviations, and Correlations

Variable	*M* (*SD*)	1	2	3	4	5
1. Persistence	4.43 (.64)					
2. Motivation	4.25 (.63)	.37*				
3. Competence	3.66 (.82)	.23*	.54*			
4. Workload	2.79 (.81)	-.08	-.27*	-.23*		
5. Help seeking	4.05 (.76)	.16*	.16*	.11*	-.09	
6. Stress	3.05 (.77)	-.12*	-.27*	-.33*	.30*	-.05

Note. * $p < .05$.

Maximum likelihood estimation was used along with a bias-corrected bootstrapping procedure (1000 bootstrap samples). Bootstrapping is a resampling method that uses a study's sample to create a sampling distribution from which standard errors and confidence intervals are created (Kline, 2005). The software package that was used was Amos 25. The analysis showed that the proposed model (which included the measurement model, or scale items, along with the path model) had adequate fit with the data, $\chi^2(175) =$

411.81, $p < .001$, CFI = .90, RMSEA = .06, SRMR = .09 (see Figure 2). The measurement part of the model is not presented in the Figure 2 in order to improve the clarity of the figure. However, all of the unstandardized path coefficients between the scale items and their constructs were significant, ps < .001, and greater than .60.

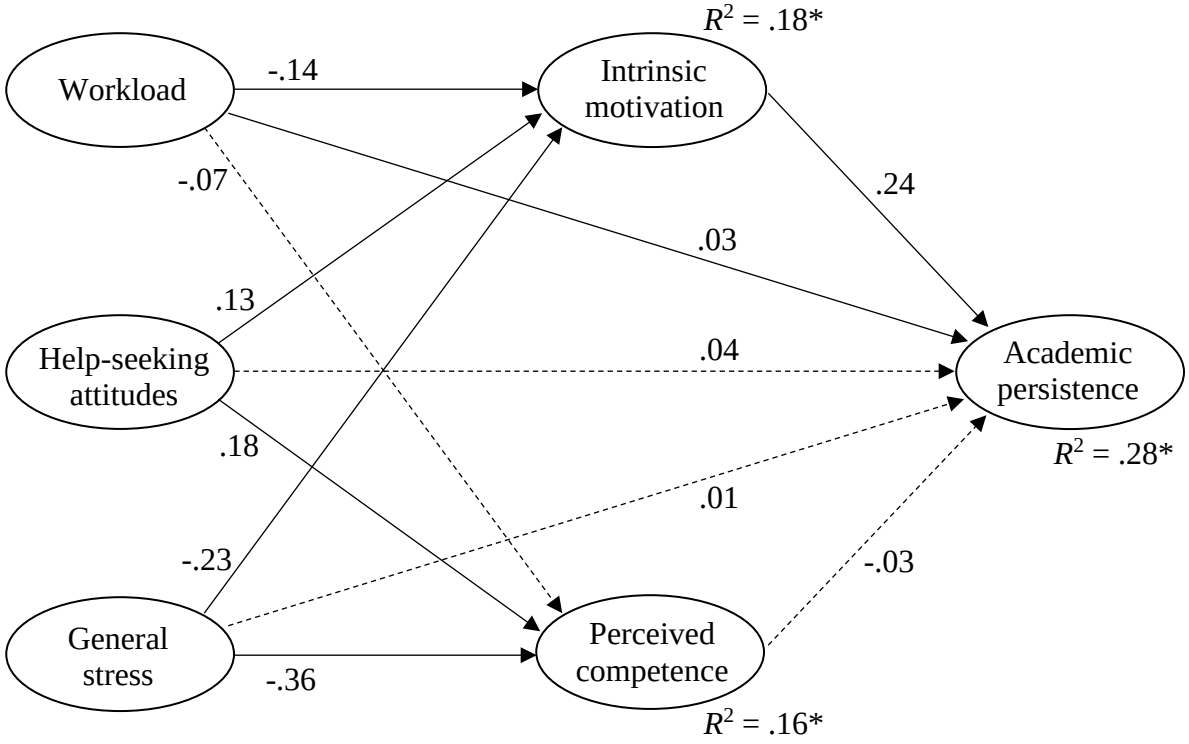

Figure 2. Structural equation model. Solid lines represent significant paths, $p < .05$. Path coefficients are unstandardized. For clarity, the measurement model is not presented. R^2 = explained variance. * $p < .05$.

Intrinsic motivation was a significant predictor of academic persistence while perceived confidence was not a significant predictor. Although competence was significantly correlated with persistence (see Table 1), when including intrinsic motivation, and the three independent variables, it did not account for any unique variance in the persistence of students.

The workload that students experienced was a negative predictor of intrinsic motivation, indicating that as workload increased, intrinsic motivation decreased. Workload also had a negative indirect effect on persistence, via motivation, but the total effect that workload had on persistence was nonsignificant (see Table 2). The bivariate correlation between workload and persistence was also nonsignificant (see Table 1). These results indicate that while an increase in experienced workload was related to a decrease in motivation, it did not have an overall effect on academic persistence.

Table 2

Indirect and Total Effects on Persistence

Variable	Indirect effects of variable on persistence via motivation/competence		Total effect
	Motivation	Competence	
Workload	-.03*	.00	.00
Help seeking	.03*	.00	.07*
Stress	-.05*	.01	-.03*

Note. Effects are unstandardized. * $p < .05$.

Help-seeking attitudes were positively related to intrinsic motivation. They also had a significant and positive indirect effect on academic persistence via motivation as well as a positive total effect on persistence. The results indicate that a constructive orientation toward help seeking was positively related to being intrinsically motivated to engage with one's studies and to the intention of finishing one's degree. Help-seeking attitudes were also a positive predictor of perceived competence. However, help-seeking attitudes did not have a significant indirect effect on persistence via perceived competence.

Finally, the general stress that students experienced was a negative predictor of their intrinsic motivation. General stress also had a significant and negative indirect effect on their persistence, via motivation, as well as a significant and negative total effect on persistence. General stress was also a negative predictor of perceived competence, but it did not have a significant indirect effect on persistence via perceived competence.

Discussion

Dropout is a common problem for many distance education institutions (Simpson, 2013). Further, it has been found that academic persistence contributes to whether students decide to drop out of their programs (Pascarella & Terenzini, 1980). It is therefore important to investigate factors that are related to the persistence of distance education undergraduate students. One factor that is often monitored in order to identify students that may be at risk of dropping out is academic competence (Simpson, 2008). However, when it comes to predicting a student's persistence, and their intent to finish their degree, intrinsic motivation and whether students are enjoying their studies might be a stronger predictor.

The present study included intrinsic motivation and perceived competence in the same model as predictors of persistence and found that intrinsic motivation was a significant predictor while perceived competence was not. In contrast, prior studies that also included intrinsic motivation and competence as predictors of persistence found that both factors were significant predictors of academic persistence (Hardre & Reeve, 2003; Lavigne et al., 2007; Simon et al., 2015). However, these prior studies were conducted with high school and junior college students. The different outcome from the present study may have been due to the

fact that the participants were distance education students. Compared to high school and non-distance education undergraduate students, distance education students are more likely to be returning to academics, they tend to have other aspects of life competing for their time and attention in terms of employment and family, and they tend to go through their degrees being more isolated from fellow students and from university staff (Jaggars, 2014; Thistoll & Yates, 2016). Considering these characteristics of distance education students, it is therefore possible that their intrinsic motivation, and the direct enjoyment they experience with their studies, plays a greater role in predicting their intentions and desires to graduate than their views regarding their academic competencies.

Considering the finding that intrinsic motivation was the stronger predictor of persistence, distance education institutions should therefore give more attention to this factor. Such attention could include periodically assessing the intrinsic motivation of students (e.g., whether they are enjoying the topics being covered in their courses and/or what they think of the assigned readings). Educators or counselors could then follow-up with students who report low levels of intrinsic motivation and discuss with them factors that can impact motivation along with potential interventions.

The present study also investigated how academic workload, help-seeking attitudes, and general stress predicted intrinsic motivation, perceived competence, and academic persistence. In prior research with distance education students that used qualitative designs, it was found that the academic workload experienced by students was one reason why students dropped out of their programs (Aragon & Johnson, 2008; Willging & Johnson, 2009). However, in the present study, it was found that while workload was a negative predictor of intrinsic motivation, workload did not have a significant total effect on persistence. Therefore, while qualitative studies indicate that the workload experienced by some students is still an issue that influences whether they drop out of their programs, the results from the present study indicate that workload is not related to persistence of distance education students in general.

Help-seeking attitudes were positively related to intrinsic motivation. They also had a positive indirect effect on academic persistence, via motivation, and a positive total effect on persistence. The help-seeking attitudes variable was a measure of whether students had a positive and open attitude toward asking for help and whether they believed that doing so was not something to be socially concerned about. The results indicate that students whose help-seeking attitudes were more positive also enjoyed their academic studies more and were more intent on finishing their degrees. Help-seeking attitudes were also a positive predictor of perceived competence, indicating that an open and affirmative view toward help seeking was positively related to students' view of their academic abilities. The positive relationship between help-seeking attitudes and competence is consistent with a prior study, on fifth grade students, that found low-achieving students were more likely to avoid help seeking than high-achieving students (Ryan, Hicks, & Midgley, 1997).

In the present study, help-seeking attitudes had positive relationships with intrinsic motivation, perceived competence, and academic persistence. These relationships suggest that distance education students should be encouraged to ask for help and encouraged to understand that doing so does not mean that their abilities are inadequate. A variety of resources and avenues for requesting assistance such as peer networks or tutors (McGhie & du Preez, 2015) could also be offered in order to fit with student preferences and to enhance their comfort with requesting help.

Finally, the general stress that students reported was a negative predictor of intrinsic motivation as well as perceived competence. It also had a negative indirect effect on academic persistence via intrinsic motivation. Not only can distance education students experience stress from their academic responsibilities but also from a variety of other sources including employment, relationships, health, and finances (Hart, 2012; Jaggars, 2014; Kampfe et al., 2006; Silinda, 2018; Silinda & Brubacher, 2016). The present study found that the general stress experienced by distance education students could have a number of detrimental effects on their readiness to engage with academic tasks. Methods to help distance education students to manage their stress, including stress from outside of academics, could improve their intrinsic motivation and subsequently their desire to persist with their degrees. Efforts to help students with their general stress could be combined with efforts to improve their help-seeking attitudes, both of which had indirect effects on academic persistence through intrinsic motivation.

Limitations and Future Research

Notwithstanding the study's contributions to understanding the academic persistence of distance education students, the study also has several limitations. Firstly, the study is a cross-sectional survey and therefore conclusions regarding any cause-and-effect relationships between variables cannot be made. Secondly, all the variables were measured using a self-report method. Self-report relies on the perceptions that participants have regarding the variables under investigation, and may therefore deviate from other, external, methods of measurement. Such deviations may be particularly relevant to the experienced workload and perceived competence variables. However, the results still make a contribution by showing that workload, as experienced by students, was not related to their academic persistence. Likewise, their own views regarding their academic abilities were not related to their academic persistence when their intrinsic motivation was included in the model. Thirdly, the study took a somewhat exploratory approach in that specific hypotheses were not developed for all of the potential relationships. As such, additional studies are needed in order to support, or refute, the present findings. Future studies should also include alternative ways of measuring the constructs. For example, while academic persistence was measured in the study at hand by simply asking students if they intended to continue with their studies, other methods of measuring persistence (e.g. asking family members or associates of students to rate whether the student seems enthusiastic or lukewarm about completing their degree) could be used. Additional studies should also be done at other universities and in other countries, as the workload that students experience could vary across universities. In addition, other facets that affect distance education students including family responsibilities, help-seeking attitudes, and manifestations of stress, could vary across cultures. Finally, the study did not include many other factors that could also be related to intrinsic motivation and academic persistence. For example, while the study included the help-seeking attitudes of students, it did not measure whether students actually requested help nor how satisfied they were when assistance was offered. It is even possible that when students first seek help, they may experience a temporary decrease in their perceived competence.

Conclusion

In conclusion, dropout rates of distance education students are a concern for many distance education institutions, as well as the students who spend money and time on pursuing degrees but then drop out

before completing them. Understanding the factors that are related to student intentions to finish is therefore important. The present study found that the intrinsic motivation of distance education students is particularly relevant to their academic persistence. While interactions with students may be more difficult at distance education institutions, having an awareness of their intrinsic motivation, and the enjoyment and interest they have regarding their studies could be beneficial in reducing the dropout rate for distance education students.

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The Nationwide Landscape of K–12 School Websites in the United States: Systems, Services, Intended Audiences, and Adoption Patterns

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Abstract

This study sought to collect URLs (web addresses) of all K-12 schools in the United States (N = 98,477) and analyze website home page system and service data for all available U.S. institutional websites (n = 65,899). Building upon previous research related to Web 2.0 educational potentials, this first-of-its-kind study sought (a) to provide descriptive results of system and service adoption and website data for all schools in the United States and (b) to detect theorized differences based upon school demographics and service/system type (e.g., open source vs. proprietary). Results indicated that proprietary and purchased systems were much more common than free and open systems, that adoption patterns were generally not meaningfully influenced by demographic data (except for charter school status), and that K-12 institutional adoption of Web 2.0 seems to be more focused on educational uses of these tools that might not strictly be considered pedagogical (e.g., community outreach).

Keywords: Web 2.0, social media, K-12 education, open source software, community outreach, communication

Introduction

Digital technologies, the Internet and Web 2.0 in particular, have expanded the possibilities available to schools and researchers for improving teaching and learning via new communication, pedagogy, data collection, and data analysis methods. Web 2.0 (or the social Web) is a broad term that refers to Internet applications that allow non-programmers to create, remix, and share content on the Web or, more generally, as "anything that uses the Internet to facilitate conversations" (Solis & Breakenridge, 2009, p. xvii). A few prominent examples include Facebook, YouTube, Twitter, and Google Apps. Web 2.0 alters and enhances the scope and methods available to individual Web users to learn, socialize, self-express, and interact with the world at large. Many research and theoretical pieces have been written on Web 2.0's proper place in K–12, but as a field, we have yet to grasp the breadth of its use and the way it is being used by actual schools. Similarly, though it is expected that most schools in the US have a Web presence and share information with their communities via their school websites, little work has been done to explore how these websites can be mined as open data resources for improving education. For example, a search of the ERIC database for journal articles with the words "school" and "website" in the title yields only 24 results in the past 10 years. As well, these results include studies that are entirely unrelated to this topic or only analyze a very small ($n < 30$) group of websites for specific resources, such as content for counseling support (e.g., Kennedy & Baker, 2015) or the presence of outdoor education programs (Campbell-Price, 2018). Through this study, we seek to address two gaps in the literature. First, we attempt to provide valuable insights regarding the adoption of general website systems and Web 2.0 resources in K–12 schools across the US, and second, we seek to provide a necessary step forward in exploring how mining openly available public school websites can be used to support research that can inform educational policy and practice.

The prospect of integrating the social Web into educational environments (particularly at K–12 levels) is greeted with a wide spectrum of responses. On one hand, the innovative and ever-improving affordances of Web 2.0 are considered beneficial for learners and teachers alike by (a) increasing learners' agency and connectedness; (b) enhancing learners' capacity to develop 21st-century skills; (c) extending boundaries of time, space, and audience that have restricted learning in the past; and (d) supporting the integration of formal and informal learning (Chen & Bryer, 2012; Dabbagh & Kitsantas, 2012; Kim, Jeong, & Lee, 2010). On the other hand, the culture of participation, commitment of resources, and theoretical paradigm shifts associated with Web 2.0 bring with them a host of legitimate concerns about student safety, institutional sustainability, and pedagogical efficacy that must be addressed before advocating for their wholesale adoption (Howard, 2013; Kimmons & Veletsianos, 2015; Weeden, Cooke, & McVey, 2013).

At its heart, Web 2.0 is participatory in nature, which theoretically implies that students, teachers, parents, and leaders in K–12 can use these tools to meaningfully interact with one another in collaborative and enriching ways. Users engaging with others via the social Web may be participating in a variety of activities including social networking, sharing user-generated content, sharing experiences and resources, and collaborating with others in virtual workspaces (Dabbagh & Kitsantas, 2012; Kim et al., 2010). Proponents of Web 2.0 adoption for educational use tend to focus their reasoning on theoretical and observed benefits for the learner. When Web 2.0 tools are used effectively, it is proposed that they can

- increase self-regulation (or self-direction) and agency for the learner (Dabbagh & Kitsantas, 2012; McLoughlin & Lee, 2010);

- empower the development of media literacy (Krutka & Carpenter, 2016);
- support critical thinking (Reich, Murnane, & Willett, 2012);
- facilitate high levels of communication and collaboration, both within and outside the classroom (Howard, 2013; Krutka & Carpenter, 2016; Luckin et al., 2009; Reich et al., 2012);
- foster creativity (Luckin et al., 2009);
- expand boundaries of time and space in which to learn (Krutka & Carpenter, 2016);
- provide professional resources and networks for teachers (Carpenter, Kimmons, Short, Clements, & Staples, 2019; Hunter & Hall, 2018; Kimmons, Carpenter, Veletsianos, & Krutka, 2018; Trust, Carpenter, & Krutka, 2017);
- enable publication to authentic audiences where cost and logistics would have previously prohibited it, thus (potentially) increasing motivation to do quality work (Krutka & Carpenter, 2016); and
- provide the flexibility necessary to allow deeper integration of formal and informal learning modes (Dabbagh & Kitsantas, 2012; McLoughlin & Lee, 2010; Vasbø, Silseth, & Erstad, 2013; Woodward & Kimmons, 2018).

Though such affordances seem promising, the rapidly-changing nature of today's technological environment also presents unique and ever-changing challenges to its adoption in K–12 environments. Educators and policy-makers must constantly balance the advantages of the social Web with the "safety, privacy, and psychological well-being" of students and the danger of damaging the reputations of teachers and administrators (Howard, 2013, p. 51; cf. also Kimmons & Veletsianos, 2015; Kimmons, Veletsianos, & Woodward, 2017; Veletsianos, Kimmons, Shaw, Pasquini, & Woodward, 2017). Furthermore, despite the great potential of Web 2.0, many studies agree that few students are actually engaging with its high-end affordances, even when they are using the technology in their classrooms (Luckin et al, 2009; Reich et al., 2012). Students need guidance in order to avoid the distractions and dangers of social media as well as to put it to its highest communicative, collaborative, transformative, and creative use (Krutka & Carpenter, 2016; Luckin et al., 2009; McLoughlin & Lee, 2010). For students to receive that guidance, teachers often need additional training in areas such as how to (a) minimize the distractions of Web 2.0 (Andersson, Hatakka, Grönlund, & Wiklund, 2013); (b) adjust privacy settings on social networking sites or SNSs (Weeden et al., 2013); and (c) use "thoughtful questions" to guide students to explore the possibilities, affordances, and challenges of the social Web (Krutka & Carpenter, 2016, p. 9).

Although the safety concerns for Web 2.0 adoption are very real, many researchers argue that this is a point in favor of its adoption, not against it. Engaging with social media in schools provides students with a more controlled and safer environment in which to experiment with the capacities of these tools. Furthermore, it may be considered a "deontological . . . responsibility" (Howard, 2013, p. 41) for teachers to help students consume and create with social media in a critical, safe, and responsible way rather than leaving them to navigate these uncertain spaces on their own. Teachers who understand the language and customs of the

cyber world (Howard, 2013) and connect with students via social media (Krutka & Carpenter, 2016) have just such an opportunity, and this scaffolded approach to Web 2.0 may take on additional security measures through the use of alternate, safer, education-specific SNS software, such as Edmodo, Schoology, and Coursesites (Howard, 2013).

While the literature is replete with postulations of the benefits and drawbacks of Web 2.0 adoption, there is no current, reliable, generalizable research that would provide an overall snapshot of how Web 2.0 technologies are being adopted by US schools, and there are no existing studies that explore institutional adoption of these tools on par with those that have been done in higher education (Kimmons et al., 2017; Veletsianos et al., 2017). Individual school and district case studies do exist (Hew & Brush, 2007), and though these provide valuable insights and a deeper look into what is occurring at selected schools, they do not give us a sufficiently broad understanding of the topic to recognize what is happening generally. This study seeks to fill this gap by providing a high level, descriptive overview of K–12 institutional use of Web 2.0 across the entire United States. Beginning by collecting a large and representative sample of public K–12 school website addresses (URLs), we then used data mining techniques explored in previous studies to identify system adoption and service linking, and connected these indicators with school-level demographic data for further analysis (Kimmons, 2015a, 2015b). Our reasons for doing this were manifold, but one specific purpose was to test the hypothesis offered elsewhere that open source and free software will be used more by those who already have access to social capital than by those who are struggling (Chander & Sunder, 2004; Kimmons, 2015b).

Our overarching research goal for this study was to provide educators and decision-makers with a general understanding of how Web 2.0 is being adopted among schools in the US. We used the following two research questions to guide us in these efforts:

1. What types of Web systems and supplemental Web 2.0 services are K–12 schools adopting institutionally?

2. What effect, if any, do factors such as poverty, locale, school size, and grade level exert on institutional adoption patterns?

Methods

This study made use of a variety of website data mining and analysis methods explored in previous studies (Kimmons, 2015a, 2015b) to collect, clean, and analyze K–12 school website data. A brief outline of our research process follows:

1. Collect website lists from Department of Education (DOE) websites of all 50 states.

2. Compile all websites into a MySQL relational database.

3. Compare to National Center for Education Statistics (NCES) data to determine coverage.

4. Use search engines and APIs (e.g., Google Custom Search) to fill in missing data.
5. Manually verify 1% of URLs.
6. Scrape all school homepages using PHP scripting and the CURL data transfer tool.
7. Verify results against NCES data to determine coverage.
8. Analyze HTML for heuristic identifiers of website systems (e.g., Wordpress).
9. Extract all links from homepages and save in the database.
10. Extract domains from links (e.g., bypass URL shorteners) and save in the database.
11. Manually code top domains and website systems based on categories (e.g., open source).
12. Analyze demographic differences in SPSS.

We will now explain each of these steps in detail.

We began by having human data collectors systematically explore state Department of Education websites to determine if lists of schools and accompanying URLs were provided for all 50 states. Data was converted from provided formats (e.g., spreadsheets, Web page lists, PDFs) to a spreadsheet for database entry. Through this process, we discovered that very few states provided such lists, and in all, we were only able to collect 6,152 websites representing 18 states.

To check the coverage of our data, we compared our list to the National Center for Education Statistics public school database because it provided a relatively recent (2013–2015) collection of school information for all US states that could be readily downloaded in Microsoft Excel format. In total, school-identifying information for 98,477 schools was imported from the NCES database, which we treated as a full and complete list of all K–12 schools in the US. We proceeded to fill in missing school URL data through various manual and guided means, depending on the needs and availability of data for each state. We also used various online search tools, databases, and APIs to supplement the process (e.g., Google Custom Search), relying on school name and location information from the NCES database as references. This process took our team of five researchers five months to complete, but the finished dataset provided URL results for 68,106 schools in the US, or 69.2% of the NCES database.

One important step in this process was manual verification that the results returned by our data queries were indeed accurate. After fetching approximately 1% of the URLs for our data set, our team manually verified that each positive result actually linked to the school (or at least the district) website of the institution in question. Part of this process was also a manual examination of each website's HTML code, which we used to create programmatic rules to heuristically determine which primary system was being used to create and host the website (e.g., embedded metadata, included files). We also extracted domain and keyword data from all provided links to identify linked systems (e.g., a link to voicethread.com revealed use of VoiceThread). In total, 1.07 million unique school-domain links were analyzed in this way.

When identifying these systems, we also coded them according to their cost and the license placed upon the source code as either purchased, proprietary/free, or open, as in previous research (Kimmons, 2015b). *Purchased* included any system for which a purchased license would be required for use (and implied closed source code). *Proprietary/free* included systems that required a license but that did not require purchase by a school (e.g., Google Sites). Finally, *open* included systems that were released under an open license, which means they were free, meaning no cost, as well as meaning users had freedom to use the system however they liked (e.g., Drupal).

Using MySQL, PHP, and existing data mining libraries, we then developed a series of persistent scripts running on a Linux Web server to systematically open and store data from all website home pages in the list. When we attempted to fetch website content from these addresses, 65,899 (96.8%) returned valid results, with the remainder returning missing link or permission denied errors. Thus, our final dataset consisted of website homepage content representing 66.9% of the NCES dataset. This sample size was sufficiently large to yield a confidence interval of +/- 0.3% on results at the 99% confidence level, provided that the sample was representative of the entire set and that specific groups of schools were not disproportionately excluded from sampling. In this process, we focused on homepages only. Due to the massive size of our dataset, traversing and scraping all subpages of these websites would have exponentially increased time and data management requirements to an extent that would have made the project infeasible. For example, scraping a single website with a conservative average of 200 subpages would have required about 6.7 minutes (based on a common page latency of 2 seconds with no errors). This seems feasible until it is applied to the entire dataset, which would have required 306 full-time days to scrape with this method and would have yielded over 13 million pages with hundreds of millions of links for analysis. Thus, our approach, though not exhaustive, seemed at least reasonable to provide a snapshot of school use of technologies at a high level without exerting effort comparable to a dedicated search engine provider.

To ensure that sampling was proportional, we compared NCES demographic data between schools for which we were able to collect a homepage versus those that we could not. Results are provided in Table 1 and indicate that sampling slightly favored more urban and poorer schools (Title I and high percentage of free or reduced rate lunches), though these sampling differences were relatively minor (within 5% of the mean). However, charter schools (public schools with less regulation) and magnet schools (public schools focused on a specific curricular theme) were overrepresented in the dataset by 10.2% to 13%. Despite this, we concluded that sampling differences were not sufficiently large between groups to warrant additional analyses, because it seemed dubious that such sampling differences would meaningfully influence other factors (such as open vs. proprietary system adoptions). We then analyzed these data in SPSS using a variety of methods (detailed in the research question subsections in the Results).

Table 1

School Sampling Demographics

	Schools listed in NCES	Homepages collected	Collected %	Sampling difference from overall
All schools	98,477	65,899	66.9%	-
Primary (elementary, middle)	71,308	48,734	68.3%	1.4%
Secondary (high)	17,232	11,404	66.2%	-0.7%
Magnet	3,221	2,485	77.1%	10.2%
Charter	6,751	5,394	79.9%	13.0%
Non-magnet/non-charter	88,573	58,101	65.6%	-1.3%
City	26,041	18,382	70.6%	3.7%
Suburb	30,566	21,229	69.5%	2.5%
Town	13,260	8,473	63.9%	-3.0%
Rural	26,683	16,725	62.7%	-4.2%
Title I	68,476	47,574	69.5%	2.6%
Non-title I	25,288	15,829	62.6%	-4.3%
Very low FRL (< 25%)	18,182	11,979	65.9%	-1.0%
Low FRL (25–50%)	24,663	16,500	66.9%	0.0%
High FRL (50–75%)	26,341	17,933	68.1%	1.2%
Very high FRL (>75%)	24,332	17,154	70.5%	3.6%

Results

The dataset generated for our study revealed that our data collection methods were highly successful in providing a wealth of data for analysis. Next, we provide detailed results for each of our guiding research questions and discuss implications of these results.

Research Question 1: Systems and Services

Of the 65,899 school websites that returned an HTML result, we were able to programmatically identify a primary system for 60.2% of schools by searching for keyword classifiers in the HTML or URL. The remaining 39.8% either used a custom-built website without a discernible system or used a system that was so uncommon that it was not represented in the manually-coded random sample. Schools used a variety of systems, including blog platforms, content management systems (CMS), learning management systems (LMS), student information systems (SIS), and hybrids. As well, 21.1% of these schools used more than one system; in these cases, each system was included in the analysis.

Recognizing the diversity and complexity of systems that were presented in the data, we quickly found it unhelpful to try to disaggregate the data by traditional categories (e.g., CMS vs. LMS) and instead generated descriptions of system use in an inclusive manner. Over two-thirds of the identifiable adoption was shared by the top six systems: SchoolWires, PowerSchool, Wordpress, SharpSchool, SchoolLoop, and SchoolInsites. Table 2 provides details of the top systems with relative frequency. However, some of these labels should be approached tenuously, because many systems are in a constant state of flux and rebranding. For instance, EdLine, SchoolWorld, and SchoolFusion are all now owned by Blackboard, which appears to be consolidating them into its Engage platform. Thus, there is some fluidity to these results, because some systems may be rebranded, merged, forked, and so on, and should not be treated as distinct entities.

Table 2

Homepage Systems and Information

System	N	% of returned websites	Cumulative % of overall market	License cost category	Developer audience
SchoolWires	9,250	14.0%	19.0%	purchased	education
PowerSchool	6,386	9.7%	32.0%	purchased	education
Wordpress	6,180	9.4%	44.7%	open	generic
SharpSchool/SchoolMessenger	4,351	6.6%	53.6%	purchased	education
SchoolLoop	3,841	5.8%	61.5%	purchased	education
SchoolInsites	2,549	3.9%	66.7%	purchased	education
Drupal	2,251	3.4%	71.3%	open	generic
Edline/SchoolWorld	1,731	2.6%	74.9%	purchased	education
SharePoint	1,524	2.3%	78.0%	purchased	generic
Weebly	1,464	2.2%	81.0%	proprietary/free	generic
SchoolFusion	1,450	2.2%	84.0%	purchased	education
SchoolPointe	1,260	1.9%	86.5%	purchased	education
eSchoolView	1,240	1.9%	89.1%	purchased	education
EducationalNetworks	777	1.2%	90.7%	purchased	education
RSchoolToday	745	1.1%	92.2%	purchased	education
CyberSchool	716	1.1%	93.7%	purchased	education
FoxBright	421	0.6%	94.5%	purchased	education
Google Sites	403	0.6%	95.4%	proprietary/free	generic
OnCourseSystems	401	0.6%	96.2%	purchased	education
SquareSpace	382	0.6%	97.0%	purchased	generic
All others	1,481	2.2%	100.0%	mixed	mixed

The identified systems were then categorized according to cost and source code licensing as

- proprietary/purchased—the system is based on proprietary code, and schools must purchase a license or subscription to use it (e.g., SchoolWires);
- proprietary/free— the system is based on proprietary code, but schools do not need to purchase a license or subscription to use it (e.g., Google Sites); or
- open—the system is based on openly licensed technology that may be freely used without additional permissions or subscriptions (e.g., Wordpress).

Results indicated that of the top 20 systems, only 2 were open (Wordpress and Drupal), and only 2 were proprietary/free (Weebly and Google Sites; cf. Table 2). When adoption of these most popular systems was aggregated, proprietary/purchased systems were the most common (56.2%), followed by open systems (12.8%), and then proprietary/free systems (2.8%). Additionally, some of these systems were developed specifically for an education audience (e.g., SchoolWires, PowerSchool, SharpSchool), while others were created for a more general audience, such as blogging or website creation (e.g., Wordpress, Drupal, Google Sites). When compared, adoption of education-specialized systems was much more common (72%) than was adoption of generic systems (25%) at a rate of roughly 3:1.

Categorized system data was then combined with institutional data to determine patterns of adoption based on school type (e.g., magnet, charter), Title I status, locale (e.g., city, rural), student free and reduced lunch percentage, student-teacher ratio, and grade level (i.e., primary, secondary). Table 3 indicates that adoption patterns were generally constant (only varying 1–2 percentage points between groups in each classification category) with a few distinct variations. First, city schools were 8% to 10% more likely (1.6 times the rate) to adopt an open system than were suburban, town, and rural schools. Second, Title I schools were 5% more likely to adopt a proprietary/purchased system than were their non-Title I counterparts, and were 6% less likely to adopt an open system. And third, charter schools were 34% to 38% more likely to adopt an open system (2.8 times the rate) and were 33% to 36% less likely to adopt a proprietary/purchased system (0.6 times the rate) than were their non-charter counterparts.

Table 3

System Category Summary

	Any	Proprietary/purchased		Proprietary/free		Open	
	n	n	%	n	%	n	%
All schools	39,702	31,294	79%	1,658	4%	8,619	22%
Primary (elementary, middle)	29,017	23,214	80%	1,161	4%	5,803	20%
Secondary (high)	6,731	5,317	79%	269	4%	1,481	22%
Magnet	1,652	1,388	84%	50	3%	248	15%
Charter	2,995	1,438	48%	210	7%	1,587	53%
Non-magnet/non-charter	25,395	20,570	81%	1,016	4%	4,825	19%
City	10,947	7,882	72%	438	4%	3,065	28%
Suburb	13,302	10,908	82%	399	3%	2,394	18%
Town	5,049	4,191	83%	202	4%	1,010	20%
Rural	9,799	7,937	81%	588	6%	1,960	20%
Title I	28,486	23,074	81%	1,139	4%	5,697	20%
Non-title I	9,825	7,467	76%	393	4%	2,555	26%
Very low FRL (< 25%)	7,127	5,630	79%	214	3%	1,639	23%
Low FRL (25–50%)	10,067	8,054	80%	503	5%	2,215	22%
High FRL (50–75%)	10,773	8,618	80%	539	5%	2,155	20%
Very high FRL (>75%)	10,085	7,866	78%	403	4%	2,118	21%
Very low s/t ratio (<10)	2,182	1,593	73%	131	6%	633	29%
Low s/t ratio (10-20)	27,588	22,346	81%	1,104	4%	5,518	20%
High s/t ratio (20-30)	7,303	5,623	77%	292	4%	1,680	23%
Very high s/t ratio (>30)	583	431	74%	17	3%	152	26%

In addition to primary Web systems, we also considered the external Web resources that each website linked to, ignoring Department of Education and other state websites, or websites that were no longer active. On average, 15.7 unique external links were detected on every school homepage that included at least one external link, and when aggregated, these external links represented 113,197 unique domains. Given the sheer size of the resulting dataset, we decided to focus analysis on only the most commonly used external links across school sites. Table 4 provides details on the top sites with relative linking frequency. Of these sites, social networking sites such as Facebook (43.7%) and Twitter (39.7%) were the most popular, but other popular sites also included search engines (e.g., Google Search), image sharing sites (e.g., Instagram, Flickr), video sharing sites (e.g., YouTube, Vimeo), Web publishing platforms (e.g., Google Sites), email

providers (e.g., Google Mail, Microsoft Online), office applications, (e.g., Google Docs / Drive, Microsoft Office 365), administrative tools (My School Bucks, Aesop Online), and various others.

Table 4

Linked External Sites and Services

Name	Frequency	% Likelihood on returned websites	Service category	Ed-specific/ generic	Free/paid
Facebook	26,073	43.7%	SNS	Generic	Free
Twitter	23,702	39.7%	SNS	Generic	Free
Google Search	12,233	20.5%	Search	Generic	Free
Google Docs/Drive	10,426	17.5%	Office applications	Generic	Free
YouTube	10,387	17.4%	Video sharing	Generic	Free
Google Sites	8,751	14.7%	Website creation	Generic	Free
Google Maps	4,255	7.1%	Maps	Generic	Free
Instagram	4,179	7.0%	SNS	Generic	Free
My School Bucks	3,357	5.6%	Administrative	Ed-Specific	Paid
Aesop Online	3,349	5.6%	Administrative	Ed-Specific	Paid
Google Mail	2,853	4.8%	Email	Generic	Free
LinkedIn	2,514	4.2%	SNS	Generic	Free
Peach Jar	2,361	4.0%	Administrative	Ed-Specific	Paid
Microsoft Online	2,091	3.5%	Office applications /email	Generic	Paid
Google Translate	2,089	3.5%	Translation	Generic	Free
Vimeo	1,801	3.0%	Video sharing	Generic	Free
School Nutrition Network	1,756	2.9%	Administrative	Ed-Specific	Paid
Google+	1,740	2.9%	SNS	Generic	Free
Google Accounts	1,739	2.9%	Administrative	Generic	Free
Frontline Education	1,562	2.6%	Administrative	Ed-Specific	Paid
Pinterest	1,540	2.6%	SNS	Generic	Free
Board Docs	1,392	2.3%	Office applications	Generic	Paid
Flickr	1,296	2.2%	Image sharing	Generic	Free
Naviance	1,268	2.1%	Academic planning	Ed-Specific	Paid
My School Building	1,266	2.1%	Building management	Ed-Specific	Paid
iTunes	1,246	2.1%	App library	Generic	Free
Accelerated Reader Book Finder	1,176	2.0%	Reading helper	Ed-Specific	Paid
Survey Monkey	1,120	1.9%	Survey creation	Generic	Free
Google Play	1,111	1.9%	App library	Generic	Free
Google Support	1,069	1.8%	Technical support	Generic	Free

From this list, a few items deserve attention. First, public (non-educational, non-restricted) social media platforms such as Facebook, Twitter, LinkedIn, Pinterest, and so forth were linked to far more often than were education-oriented services (e.g., My School Bucks). Second, free websites were much more common than paid services. Third, Google as a service provider was prevalent as the owner of almost one-third of all top 30 services. And fourth, many services that are commonly discussed in association with Web 2.0 and schools were noticeably missing from this list (e.g., Edmodo, PBWorks, VoiceThread, Khan Academy). Even though such services were represented in the large dataset, their relative popularity did not merit inclusion in the most popular link tables, as they generally represented a low likelihood of inclusion on school websites (~1.5% or less).

Research Question 2: Adoption Factors

Given the descriptive results provided in Table 3, we chose to conduct a chi square test for association between open or proprietary/purchased system adoption and charter school status. Phi was used to determine the strength of associations (Warner, 2012). Results indicated that charter school status was significantly associated with open system adoption, $\chi(1) = 1{,}857.33$, $p = .00$, with moderate strength, $Phi = .23$, and that charter school status was also significantly associated with proprietary/purchased adoption, $\chi(1) = 1{,}815.01$, $p = .00$, with moderate strength, $Phi = -.22$. Thus, we concluded that charter schools were moderately more likely to adopt open systems and were moderately less likely to adopt proprietary/purchased systems than were their counterparts.

Similarly, we conducted a second chi square test for association between open or proprietary/purchased system adoption and urban school status (collapsing suburban, town, and rural schools into a single non-urban category). Results indicated that urban school status was significantly associated with open system adoption, $\chi(1) = 356.36$, $p = .00$, with weak strength, $Phi = .1$, and that urban school status was also significantly associated with proprietary/purchased adoption, $\chi(1) = 459.78$, $p = .00$, with weak strength, $Phi = -.11$. Thus, we concluded that urban schools were somewhat more likely to adopt open systems and were somewhat less likely to adopt proprietary/purchased systems than were their counterparts.

Finally, we conducted a third chi square test for association between open or proprietary/purchased system adoption and Title I school status. Results indicated that Title I school status was significantly associated with open system adoption, $\chi(1) = 151.47$, $p = .00$, with weak strength, $Phi = -.06$, and that Title I school status was also significantly associated with proprietary/purchased adoption, $\chi(1) = 102.46$, $p = .00$, with weak strength, $Phi = .05$. Thus, we concluded that Title I schools were somewhat less likely to adopt open systems and were somewhat more likely to adopt proprietary/purchased systems than were their counterparts, and though these results were statistically significant, they were not practically significant (given the weak Phi values).

When links to supplemental or external services were then disaggregated according to demographic data, a few items of interest arose (cf. Table 5). First, charter schools linked more frequently to many prominent social media and app management resources like Facebook, YouTube, Instagram, iTunes, and Google Play than did their counterparts (often at almost double the rate), but charter schools also linked less frequently to file sharing and email services like Google Docs/Drive, Board Docs, Google Mail, and Microsoft Office 365. Second, city and suburban schools were more likely to link to image and video sharing services like

YouTube and Instagram. Third, Title I schools were less likely to link to some resources including Facebook, Twitter, Google Docs / Drive, and Aesop Online than were their counterparts.

Table 5

Supplemental Service Adoption and Difference From Mean Based on School Category

	Any	SNS		Image/video sharing		File sharing/email				Administrative	
		Facebook	Twitter	YouTube	Instagram	Google Docs/Drive	Google Mail	Microsoft Online	Board Docs	My School Bucks	Aesop Online
All schools	59,720	43.7%	39.7%	17.4%	7.0%	17.5%	4.8%	3.5%	2.3%	5.6%	5.6%
Primary (elementary, middle)	43,013	-0.9%	-0.5%	-0.7%	-0.4%	-0.8%	-0.2%	-0.2%	0.3%	0.4%	0.2%
Secondary (high)	10,227	1.9%	3.6%	2.0%	1.0%	4.2%	0.6%	1.1%	-0.5%	-0.5%	0.3%
Magnet	2,241	-1.1%	3.4%	2.1%	0.9%	-3.4%	-3.2%	-0.8%	-1.1%	1.0%	-1.8%
Charter	4,807	17.9%	5.3%	7.8%	5.4%	-7.9%	-2.5%	-2.2%	-2.1%	-3.7%	-4.6%
Non-magnet/ non-charter	38,564	-1.9%	-0.6%	-0.3%	-0.2%	-0.1%	-0.3%	-0.7%	0.7%	0.5%	-0.2%
City	17,605	2.6%	4.1%	4.2%	3.3%	-4.5%	-3.3%	-0.5%	-0.8%	-1.1%	7.7%
Suburb	19,313	1.5%	7.1%	2.9%	0.9%	-0.2%	-0.5%	-0.4%	1.4%	1.3%	-0.8%
Town	7,693	0.9%	-6.4%	-4.7%	-2.5%	3.6%	3.0%	0.4%	-0.2%	0.1%	2.2%
Rural	15,109	-5.5%	-10.6%	-6.2%	-3.7%	3.5%	2.9%	0.9%	-0.6%	-0.4%	2.8%
Title I	43,107	-1.2%	-1.8%	-1.0%	-0.2%	-1.1%	0.2%	0.1%	0.0%	-0.1%	-4.1%
Non-title I	14,371	2.4%	4.9%	2.3%	0.0%	3.6%	-0.3%	-0.4%	0.3%	0.5%	0.2%

Discussion

This study has revealed that K–12 institutional homepages generally take the form of purchased, proprietary systems linking to predominantly free Web 2.0 resources. Some important areas of discussion that arise from these results include (a) the undocumented and varied nature of these school websites, (b) the non-pedagogical institutional benefits of Web 2.0 for schools, and (c) adoption differences based on school demographic factors. We will now discuss each of these areas in depth.

Undocumented Nature of School Websites

First, as we proceeded with this study, it was striking to us how difficult it was to collect institutional website data across states or even to gain access to a list of website URLs. Some states provided lists of school websites on a Department of Education or other state-run source, but this was not the norm, and the few lists that were provided were typically out-of-date, incomplete, and difficult to navigate (e.g., showing only a single website URL on a page). Other school-identifying data, such as physical addresses, enrollment, Title I status, and so forth were much more readily available than were Web addresses, which suggests that public school website data seems to be of little interest to those who generally collect, report, and make policy based on school data. This is potentially alarming, because state and federal policy-makers enact policies that could be meaningfully informed by such data (including service licensing, free and open source software adoption policies, professional development opportunities, and so forth). However, at present there does not seem to be a readily available method for states to even collect their own data in this regard, let alone data beyond the state level.

This situation is likely the result of localized control over website and Internet-related decisions among US schools, as few decisions related to system adoption are made in a top-down manner or in a manner informed by what other schools are doing. Thus, principals and other local decision-makers are left to enact Web use policies with limited data and are likely susceptible to vendor-driven marketing strategies, such as purchasing systems based on sales pitches rather than comparative or diffusion data. This result underscores the need for future adoption and landscape studies in this same vein to provide an ongoing understanding of what schools and systems are adopting, so that decision-makers can have a realistic sense for the options available to them and the relative diffusion of those options among peer institutions.

Non-Pedagogical Institutional Benefits

Second, it is clear from this study that Web 2.0 tools serve important functions in K–12 schools that likely extend far outside the realms of pedagogy (e.g., Dunlap & Lowenthal, 2009; Kimmons et al., 2018; Trust et al., 2017), even though it is the pedagogical potential of these tools that is most predominant in the literature. A comparison of the top 30 supplemental Web 2.0 services listed in Table 4 shows that the types of services most commonly adopted were, in order of prevalence, (a) SNSs (42.8%); (b) administrative and office support tools (23.8%); (c) multi-purpose tools (i.e., they can be both academic or administrative) (22.1%); and (d) media sharing tools (9.7%). Of these top 30 tools, only 1.7% were tools that were strictly academic in nature. This may be a reflection of the diversity of choices in academic Web 2.0 tools and the fact that schools may adopt one tool over another even though the tools themselves do similar things. However, nuances of the data also suggest that the stakeholders and those creating school websites cater

their designs to broader educational concerns than pedagogy alone. These concerns may include community and parent outreach initiatives, administrative tasks, marketing, and data archival.

Almost half of all schools had a link to Facebook on their homepage; schools were much more likely to use a generic, popular tool like Facebook, Twitter, or Instagram than they were to use school-specific alternatives like Edmodo and Schoology. There could be a number of reasons for this, but the simplest explanation seems to be that generic tools fill a need that school-specific tools cannot, and in the case of SNSs, these needs might include community outreach and marketing.

For example, consider Facebook (a generic, public SNS) versus Edmodo (an education-specific, more private SNS). On the surface, these two SNSs appear to have much in common, as they both (a) operate by users making individual posts that appear in a news feed and can contain text, images, videos, polls, and events; (b) enable users to create profiles; (c) facilitate the creation of private groups; and (d) have similar design elements and shades of blue in their interfaces.

In many ways, Edmodo and Facebook are similar, but Edmodo is additionally engineered specifically toward meeting requirements valued by educational institutions that would seem to make it a better option for education. From a safety perspective, Edmodo's structure as a private SNS protects student data by default, whereas in Facebook, default sharing settings need to be adjusted in order to make classroom or community groups private. In this way, Edmodo seems to be better suited to protect students from Internet predation, cyber bullying, or identity theft; in addition, Edmodo does not contain ads that might present inappropriate content to students. Further, from a pedagogical perspective, Edmodo was built for education, and its course and assignment-building features enable it to additionally serve the function of a learning management system (LMS), supporting grading, attendance, and so forth. Because it has fewer features than Facebook, it also presents a simpler interface, which would presumably make it easier for teachers and students to adopt and navigate.

In light of these potential benefits, why is Edmodo adopted at such a low rate compared to Facebook? Only 1.3% of our sample adopted Edmodo while 43.7% adopted Facebook. This pattern may be partially explained by the fact that most schools that adopt a school-specific service probably also adopt a generic one (i.e., a school who adopts Edmodo is more likely to adopt Facebook [+8.8%]). However, this factor alone does not seem to merit the drastic difference in relative adoption rates of these disparate systems. A more likely explanation seems to be that schools are using these tools not for their teaching and learning benefits but for their non-pedagogical marketing, communication, and outreach functions.

Another example of this pattern is the comparison between SchoolTube, an education-focused video repository, and YouTube, a public video repository for just about everything (e.g., entertainment, news). While YouTube does have specific policies against some objectionable content, SchoolTube's policies are generally stricter, and the videos there are screened and moderated by volunteers to prevent students from gaining access to inappropriate video content. Similarly, because SchoolTube content is designed to be strictly educational, students using the platform will be less likely to receive suggestions and ads that contain objectionable material than if they were to use YouTube. For these reasons, schools and districts regularly impose bans on YouTube for their students and teachers, making services like SchoolTube a more viable video platform for teachers.

Despite these benefits, many more schools in our sample linked to YouTube (17.4%) than to SchoolTube (0.4%). This is likely due in part to the fact that YouTube is a much more effective community outreach tool than is SchoolTube, so schools that view outreach as a primary purpose of their website are more likely to link to YouTube than to SchoolTube. This may also reflect the commercial platforms' design and usability superiority compared to their education-oriented counterparts. Interestingly, however, schools that adopted SchoolTube were also 22.4% more likely to adopt YouTube than schools that did not. This is roughly twice the rate of YouTube adoption without SchoolTube, and may suggest that many schools value both technologies for different reasons or for different audiences. They may, for example, choose YouTube for their community and parent outreach initiatives and SchoolTube or similar services for more student-centered, pedagogical aims.

Another point along this vein is the fact that charter schools were 47% more likely to adopt both Facebook and YouTube than were their non-charter, non-magnet counterparts. Under our hypothesis, the most likely reason for this is that charter schools, by their nature, are more interested in recruiting students and families to their organization than are regular public schools, which might be considered the educational default for most families. Thus, charter schools are more likely to use SNSs that lend themselves to community outreach and social marketing. In all of these examples, it seems that educational benefits (i.e., benefits that affect any aspect of the educational ecosystem) of Web 2.0 are not synonymous with pedagogical benefits (i.e., benefits that only affect teaching efficacy) but that educational institutions find great value in using these tools in non-pedagogical ways. This may also be a distinction between institutional versus classroom adoption, whereas most current research focuses on the latter while ignoring the former. Ongoing research related to Web 2.0 should build on this realization to more fully consider how these improved communication and collaboration tools are becoming educationally useful in a broader sense (e.g., community outreach, archiving, marketing, scheduling, sharing). To corroborate this finding, it is noteworthy that school website content was found to be written for a standard audience across grade level or demographic differences. This suggests that school websites—and the tools they link to—are primarily intended to support the school's interactions with the public rather than interactions among teachers and students.

Demographics of Adoption

Third and finally, both differences and similarities in Web 2.0 adoption among schools across demographic groups suggest a variety of implications for practice and future research. Building on the theoretical notion of the romance of the public domain (Chander & Sunder, 2004; Kimmons, 2015b), we entered this study expecting to find that wealthier, better-resourced schools (i.e., those with more social capital) would benefit more from open source software. Generally, our results revealed this assumption to be accurate (from a statistical perspective). Title I schools, for instance, adopt open source software less, though this result was not very meaningful (from a practical perspective), because the adoption differences were not drastic. Thus, we were led to conclude that though the romance of the public domain does exist in this regard, and those with greater access to resources will technically benefit more from open resources, any differences will be relatively minor.

However, charter schools were much more likely to adopt open source software than were their non-charter counterparts, and were much less likely to adopt a proprietary/purchased system. The reason for this is

unclear, but it may be due to differences in funding (e.g., money to personnel vs. licenses), expertise of technology support personnel (e.g., corporate vs. education background), or other factors. Future research should explore this issue by interviewing charter school personnel to determine their reasons for adopting open platforms over others.

Differences in service linking also varied in the case of charter schools with their more frequent linking to SNSs and image/video sharing services than did their counterparts. The reason for this is also unclear but may stem from the increased attention charter schools may pay to marketing strategies or community outreach, both to garner student applications and to justify their existence as a respected alternative to their non-charter counterparts. Future research should explore how charter schools in particular use these Web 2.0 tools, and why their status as chartered organizations might influence this.

Some small but potentially interesting differences in adoption might also exist between schools based upon locale or wealth factors (e.g., urban vs. rural, Title I status), but most of these seem fairly intuitive. For instance, urban (+26%) and suburban (+49%) schools were more likely to link to Google Translate than were their rural peers, presumably because their students reflect a greater diversity of home languages being spoken. In any case, these subtle differences might merit additional study in future research to determine how specific Web 2.0 tools meet the contextual needs of specific types of schools.

Limitations

Our methods of data collection provided a variety of benefits over other common methods, such as contacting schools directly or conducting surveys of use, but also introduced some limitations that should be considered when interpreting results. In terms of benefits, this approach prevented errors due to self-reporting bias (e.g., saying that a school uses a technology when it does not), self-selection bias (e.g., schools not responding to requests for information), and lack of institutional self-awareness (e.g., a superintendent not knowing all of the technologies being used in a school). By using public-facing websites as the data source, we were able to exclude human sources of data errors and were able to consider technologies actually in use versus those that are thought or expected to be in use by those who would respond to a survey or questionnaire. Our methods also allowed us to collect data on all schools in the US, not just a small subset, thereby ensuring massive data coverage and scale. The major limitation of this approach, however, is that internal systems (e.g., student information systems used only for intra-institutional bookkeeping) would be excluded from analysis, though such exclusion makes sense given our emphasis on Web 2.0 tools rather than productivity and management tools. Another limitation of this approach was that we were not able to determine extent of use. So, if a school provided links to Google Docs, for instance, we could say for certain that the school used Google Docs but not how much they used them. This is a necessary limitation of other common approaches as well (e.g., self-reports would be unreliable for collecting such data) and would warrant future studies on Web traffic and usage statistics.

Conclusion

The integration of Web 2.0 into K–12 schools is an undertaking fraught with safety concerns, lack of resources, and a good deal of training and guidance necessary for its success. However, it is also an undertaking rich in its potential to (a) increase self-regulated learning; (b) foster the development of communication, collaboration, and creativity; (c) eliminate the barriers of time, space, and community that can restrict both breadth and depth of education; and (d) integrate formal and informal learning in highly productive ways. This study has provided a first step in understanding the landscape of Web 2.0 adoption across K–12 institutions in the US, including demographic factors influencing adoption and different types of systems (e.g., open vs. proprietary), and for determining how public data mining of the open Internet can be used to inform educational practice and policy. For distance education, it is necessary to understand these topics because they inform tool selection and opportunities for both formal and informal learning via Web 2.0 in K–12. In choosing whether, when, and how to adopt elements of the social Web, schools, classrooms, and leaders should carefully consider both the potential and the limitations of such adoption and also have a sense for how other schools are doing this en masse. As others build upon and supplement the methods and results of this study, we hope that decision-makers at all levels will be better informed regarding actual Web 2.0 use in schools so that their decisions will be grounded in meaningful, generalizable data.

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Patterns of Students' Utilization of Flexibility in Online Academic Courses and Their Relation to Course Achievement

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Abstract

Online academic courses provide students with flexible learning opportunities by allowing them to make choices regarding diverse aspects of their learning process; hence, such courses support personalized learning. This study aimed to analyze the ways students make use of flexibility in online academic courses based on learning time, place, and access to learning resources, as well as to investigate how this relates to differences in course achievement. The study examined 587 students in four online courses. Educational data mining (EDM) methodology was used to trace students' behavior in the courses and to compute 34 variables, which describe their use of flexibility. The results show that students developed different patterns of learning time, place, and access to content, which indicates that flexibility was used substantially. Students' achievements were significantly related to patterns of learning time and access to learning resources. Understanding the different patterns of flexibility usage may support the design of personalized learning and increase collaboration among students with similar characteristics.

Keywords: Flexible learning, personalized learning, online academic courses, educational data mining, course achievement, learning behavior

Introduction

Online courses provide flexible learning opportunities to learners. Flexible learning is based on the recognition of differences among students, which are addressed by providing varying degrees of choice to learners regarding what, where, when, why, and how to learn (Bergamin, Ziska, Werlen, & Siegenthaler, 2012; Collis & Moonen, 2002; Hill, 2006). Hence, flexible learning supports personalized learning, wherein learners' needs, interests, backgrounds, and learning styles are central. It reflects a shift from teacher-centered pedagogies and practices towards more innovative, student-centered approaches (Wanner & Palmer, 2015). Studies have indicated that flexibility is perceived as beneficial to online instruction (Gillingham & Molinari, 2012; Soffer, Kahan, & Livne, 2017) and constitutes a key factor in students' enrollment in online courses (Jaggars, 2014).

The provision of flexible learning opportunities, however, does not necessarily lead to effective learning, as simply providing a range of options to learners does not bring with it deep learning (Goodyear, 2008; Willems, 2005). With the freedom comes responsibility, which requires real commitment and discipline (Hill, 2006). Hence, flexible learning requires that students take on more control of the learning, make their own decisions and invest a greater level of dedication (Grant & Hill, 2006; You, 2016). Studies indicated that students may need ongoing support in this process (Willems, 2005). Hence, it is essential to study how students make use of flexibility and how it relates to their achievements, in order to understand the best way to integrate it and support students' learning.

Educational data mining (EDM) is an evolving research methodology that enables the trace of students' behavior in online environments. Online learning environments, including learning management systems (LMS), automatically record students' learning activity on servers (Soffer, Kahan, & Livne, 2017; You, 2016). Among other things, analyzing this data using advanced techniques enables the discovery of meaningful patterns, the adjustment of instructional strategies, and the ability to make data-driven decisions rather than decisions based solely on students' self-reports (Dietz-Uhler & Hurn, 2013; Gašević, Dawson, & Siemens, 2015). Notably, few studies have used LMS data to analyze students' use of flexibility components in online courses and compare the results with course achievement. For example, Cornelius and Gordon (2008) reported on three different strategies for student engagement with flexible online resources, based on interviews with participants and examination of course statistics.

Consequently, the aim of this study was to use EDM to analyze patterns of undergraduate students' use of flexibility in four asynchronous online academic courses, and examine how they are related to differences in course achievement. The data mining methodology made it possible to trace students' actions in the courses and examine their use of flexibility in practice. The study examined the use of three flexibility dimensions: learning time, learning place, and access to learning resources. In addition, the study examined whether or not there are differences in course achievement among students who use flexibility differently. This study contributes to our understanding of the various patterns of flexibility usage by students, which may support better integration of flexibility into online courses, better design of personalized learning, and increased collaboration among students with similar characteristics.

Background

Flexible Learning

Flexible learning is not a new concept and has been a core issue in distance education for some time (Bates, 2001; Hill, 2006). A central element of flexible learning is the provision of choice to learners. Instead of the instructor or the institution making key decisions about learning dimensions, the learner has a range of options from which to choose (Collis & Moonen, 2002; Jochems, Van Merriënboer, & Koper, 2004). Thus, flexible learning involves loosening logistical and educational constraints, and is often related to student-centeredness as well as to individualization in teaching and personalization of the learning process (Collis & Moonen, 2001).

It is a challenge to define flexible learning, due to its manifold characteristics. As a result, diverse concepts have been developed around it (Bergamin et al., 2012; Collis & Moonen, 2002), which vary, in part, in terms of the flexibility dimensions to which they refer. Collis, Vingerhoets, and Moonen (1997), for example, referred to five sets of dimensions in which flexibility may be provided: (a) time, (b) content, (c) entry requirements, (d) instructional approach and resources, and (e) delivery and logistics. Boer and Collis (2005) distinguished between planning-type flexibility, which the instructor can designate before the course begins and which needs to be managed when the course is offered, and interpersonal flexibility, which relates more to the dynamics of the course as it is experienced by the learners. Hill (2006) distinguished between flexible delivery, which focuses on options regarding access for learners, and flexible learning, which focuses on options related to how learning occurs. Bergamin et al. (2012) identified seven categories of flexibility: (a) time, (b) space, (c) methods, (d) learning styles, (e) content, (f) organization and infrastructure, and (g) requirements.

Flexible Learning in Online Courses

Over the years, as distance education entered the online space, flexible and personalized learning became linked with the use of new information and communications technology (ICT), which give students greater diversity in their learning (Gedera, Williams, & Wright, 2015; Wanner & Palmer, 2015). Indeed, research affirms that online learning environments enable students to experience flexibility by allowing them to decide when, where, and what they can learn (Gedera et al., 2015; Hung, Chou, & Chen, 2010). Thus, among others, online learning environments support flexibility of time, place, and access to learning resources. The current study focuses on these three dimensions.

Flexibility of time relates to diverse time-related aspects, including: (a) when students can start and end a course, (b) times for interacting within the course, (c) frequency and pace of learning, (d) duration of learning, as well as (e) timing the moments of assessment (Boer & Collis, 2005). Online courses can provide learners with access to course content anytime. Harasim (2000) claimed that flexibility of time, which allows access to course content around the clock, enables students' participation all week, thus supporting continual knowledge building and allowing students to participate at their best learning readiness time. However, the advantages of taking a flexible course (e.g., doing the course work whenever it is convenient) might become disadvantages (e.g., there is never a convenient time to do the course work) (Hill, 2006).

Flexibility of place refers to where the learning occurs (Collis & Moonen, 2002; Hill, 2006). Flexibility in this regard means that learning can take place at locations that suit the learner (Goodyear, 2008). Online courses support flexibility in learning place by allowing access to course materials from

anywhere (Glance, Forsey, & Riley, 2013). According to Goodyear (2008), flexibility in learning place can minimize disruptions and dissolve unhelpful boundaries between a learner's various activities (e.g., at work or at home) and learning.

Online learning also permits flexibility regarding learning resources (Hung et al., 2010). This includes flexibility in: (a) the modality and origin of study materials, (b) amount of content, (c) sequence of different parts of a course and study routes, (d) assessment standards, and (e) completion requirements (Collis & Moonen, 2002; Cornelius, Gordon, & Ackland, 2011; Hung et al., 2010). Unlike traditional learning environments, which typically require students to follow a linear sequence, online environments allow learners to follow a more individualized approach: viewing the instructional material in a sequence that best meets their needs, repeating or skipping sections, and following subjects regardless of the order in which they have been arranged (Hung et al., 2010). Moreover, audio and video formats enable students to control the pace at which they consume and review content (Neville et al., 2015). Flexibility regarding content may range from being completely open, where the learner is making all the choices, to providing options within a particular framework established by the instructor (Hill, 2006).

Previous studies have established that flexibility constitutes a key factor in students' enrollment in online courses (Gillingham & Molinari, 2012; Hung et al., 2010; Jaggars, 2014; Northrup, 2002). Students choose online courses for many reasons, including the opportunity to better balance their busy life schedule, which is full of responsibilities such as childcare and work (Gillingham & Molinari, 2012; Jaggars, 2014). Some students believe that online courses allow them to use their learning time outside of class more efficiently than in-class time. Others choose online courses in order to reduce the number of times they have to travel to campus. Jaggars (2014) reported that students appreciate the comfort of working at home (e.g., taking breaks, having snacks), and some feel that instructional materials in a flexible format offer them more control while still supporting course outcomes (Neville et al., 2015).

Nevertheless, flexible learning environments require students to exercise control over different aspects of their learning activities, such as time-management, type of media accessed, pace, and depth (Hung et al., 2010). Hence, flexible learning leads to a learning situation where students need to be organized, to set their own objectives and plan, and to regulate and evaluate the learning process themselves (Narciss, Proske, & Koerndle, 2007; You, 2016). Cornelius and Gordon (2008) expressed the need for further research to investigate what learning strategies learners adopt in a flexible online environment.

Several studies have addressed the relation between flexible learning and learning achievements. Some indicated a positive relation; Marton, Hounsell and Entwistle (1997) found that a wide range of learning options is pedagogically desirable and improves achievement. Brown and Smith (2013) argue that flexible learning, which adopts a student-centered approach, is more effective for improving learning achievement. Others found that the effect of greater student autonomy over the learning environment on academic achievement is ambiguous, with greater autonomy likely to improve academic achievement for some students but not others (Guest, 2005).

The aim of this study was to analyze the ways students use flexibility in online academic courses in practice. Following the literature review, for this study we defined flexibility in three dimensions: (a) learning time (i.e., during the semester, the week, and the day); (b) learning place (i.e., on campus and off campus); and (c) access to learning resources (i.e., re-access and sequence of access). In addition,

the study examined whether there are differences in course achievement among students who make use of flexibility differently.

The Study

Research Questions

This study was framed by the following four research questions:

1. What are the patterns of students' use of learning time flexibility in online academic courses?
2. What are the patterns of students' use of learning place flexibility in online academic courses?
3. What are the patterns of students' use of flexibility of access to learning resources in online academic courses?
4. Are there significant differences in course achievement among students who exhibit different patterns of flexibility usage?

Research Population and Field

The study examined the behaviors of 587 undergraduate students who participated in one of four asynchronous online courses in the academic year 2015/2016. These courses are part of an academic program which is mandatory for all undergraduate students at the university. The program offers students the opportunity to study courses in fields unrelated to their major degree program. Thus, the courses are characterized by a wide range of participants from various disciplines.

The online courses that were examined in this study are from the faculties of humanities and arts. The one-semester (13-week) courses are two credit hours each and are taught via the Moodle learning management system (LMS). As part of the development of these courses, a consistent instructional course model was created and implemented, such that each course consisted of between 11 to 14 learning units, comprising the core of the online course. The learning units were built in a linear order, so that each unit is based on the previous one. Each learning unit covered a different topic and consisted of: (a) video lecture by the instructor; (b) text summary of the lecture; (c) course materials associated with the learning unit (e.g., textbook, presentations, articles, YouTube links, course dictionary); and (d) assignments, as some units were accompanied by an online, required assignment for students to practice certain topics and receive feedback from the instructors. The students were obliged to pass a final exam on campus. The final course grade was comprised of the assignment grades and the exam grade. Although the course design and structure were consistent, there were some differences among the courses, as presented in Table 1.

Table 1

The Structure of the Online Courses

Design element	Course (faculty)			
	Course 1 (Humanities)	Course 2 (Arts)	Course 3 (Humanities)	Course 4 (Arts)
Learning units	14	11	12	12
Assignments	4 mandatory out of 5	3 mandatory	2 mandatory	2 mandatory
Video lectures (parts)	51	44	40	41
Course materials	21	53	7	44

During course development, explicit choices were made as to which flexibility dimensions would be provided to students. It was decided that all of the course content would be uploaded and opened for the students from the beginning of the course. Thus, flexibility was provided in terms of: (a) learning time (i.e., students could span their learning during the semester, the week, and the day, according to their preferences and needs); (b) learning place (i.e., students could learn on campus or off campus, according to their convenience); and (c) access to learning resources (i.e., all learning resources, including assignments, were available from the beginning of the course and students could re-access them, choose the sequence of access, and submit the assignments as they desired). It should be noted, however, that in order to provide a learning framework for students, assignment submission was limited by deadlines. Thus, flexibility in time was limited to some extent. Furthermore, the courses were structured with fixed start and end dates, finishing with a final exam on campus.

Method and Procedures

The data was collected automatically by the LMS and included a log file with over 204,000 records of students' activities in the course websites, as well as their grades. Each record documented a student's action in the course (e.g., entering a learning unit, playing a video lecture, accessing a course material) and contained information regarding the user id (anonymized), user IP address, action time, and action type. For ethical considerations, the data was anonymous and the students were informed upon their first entry to the LMS that the university might collect data regarding their online activity for research purposes.

Using SQL (Structured Query Language) queries, two different kinds of variables were computed. The first was from the student perspective—21 variables were computed per student, describing his/her activity in the course website in regard to the three flexibility dimensions examined, as well as the final course grade. The second was from the learning unit perspective—13 variables were computed per learning unit, describing the portion of students who accessed it every week, in order to examine the sequence of student accesses to the learning resources. Table 2 summarizes all the study variables.

Table 2

The Variables Computed

Perspective	Flexibility dimension	Variables	Details
Student	Learning time during the semester	% of student's actions in the course website in each quarter of the semester (4 variables)[a]	Quarter 1, ..., Quarter 4
	Learning time during the week	% of student's activity in the course website on each day of the week (7 variables)[b]	Sundays, ..., Saturdays
	Learning time during the day	% of student's actions in the course website in each part of the day (4 variables)[a]	Mornings: 06:00–12:00, Noon hours: 12:00–18:00, Evenings: 18:00–24:00, Nights: 24:00–06:00
	Learning place Location	% of student's actions in each place (2 variables)[c]	On campus, Off campus
	Access to learning resources	Average number of student's accesses to a learning resource – by type (3 variables)	Learning units, Course materials, Video lectures
Learning unit	Sequence of accesses	Number of students who accessed the learning resource every week (13 variables)	Week 1,..., Week 13
Student course achievement	-	Final course grade (1 variable)	

[a] Percentage of student's actions in the course website was calculated as the number of student's actions in the course website during the time period examined, divided by the total number of the student's actions in the course website during the course.
[b] Percentage of student's activity in the course website was calculated as the number of times in which the student was active in the course website on the day examined, divided by the total number of days in which the student was active in the course website.
[c] Percentage of student's actions on and off campus was calculated based on the IP address from which the action was executed. Actions that were executed from IP addresses that belong to the range of the university's IP addresses (for wired or wireless communication) were considered on campus, whereas the remainder were considered off campus.

Next, in order to characterize the ways that students used flexibility, two approaches were used. From the student perspective, the variables were analyzed using two-step cluster analyses. Cluster analysis is an exploratory data mining approach for discovering the structure in data without an a priori idea of

what should be found. This analysis enables the discovery of data points that naturally group together, splitting the data set into a set of clusters (Baker & Siemens, 2014). Hence, cluster analyses were used in this study to identify groups of students who exhibited similar patterns of using the flexibility aspect under investigation. Specifically, four cluster analyses were conducted, to identify patterns of using the flexibility of: (a) learning time during the semester, (b) learning time during the week, (c) learning time during the day, and (d) re-accessing learning resources. It should be noted that using flexibility of learning place was examined using descriptive statistics, because it was measured by two complementary variables.

Each cluster analysis was performed several times to explore and evaluate different numbers of clusters, in order to find the one that revealed the most insightful patterns and achieved a good silhouette coefficient score. The silhouette coefficient score, a measure of the cohesion within a cluster and separation between the clusters, was used to quantify the goodness of the clustering. The coefficient ranges from -1 to +1, such that a score is considered good if it is greater than 0.5, fair if it is between 0.2 and 0.5, and poor if it is less than 0.2 (Kaufman & Rousseeuw, 2009; Norusis, 2012). In addition, ANOVA tests were applied to determine if the differences between the clusters were significant. Significant differences were then assessed by Tukey post-hoc analyses. Since the research examined four different online courses, chi-squared tests were applied to determine if there was a significant dependence between the courses and the clusters.

From the learning unit perspective, heat map visualizations were used in order to examine the students' use of flexibility of sequence of access to the learning resources. The heat map displays the portion of students who accessed each learning unit every week, in order to analyze the ways students chose to access the course content, when flexibility of sequence was provided. Since the study examined four different courses, which consisted of different numbers of learning units, a separate heat map was created for each course.

Results

Patterns of Students' Use of Flexibility of Learning Time

Regarding learning time during the semester, examination of students' activity in the course websites revealed that they tended to span their activity quite evenly over the semester quarters. The average student activity in each quarter of the semester ranged from 21% to 26% of his/her total activity in the course website. However, the standard deviations ranged from 13% to 20% per quarter, which indicates that there was variance among the students in this regard.

Using cluster analysis, five patterns of behavior were identified: (a) 36.6% (n=215) of the students spanned their activity over all quarters quite evenly, on average; (b) 19.4% (n=114) of the students performed a major part of the their activity, 48% on average, during the third quarter; (c) 15.5% (n=91) of the students performed 42% of their activity, on average, during the second quarter; (d) 15.3% (n=90) of the students performed 60% of their activity, on average, during the fourth quarter; and (e) 13.1% (n=77) of the students performed 51% of their activity, on average, during the first quarter. The silhouette measure of the model was 0.4. ANOVA tests showed statistically significant differences among the clusters in regard to all the clustering variables (p<0.001), and in regard to course achievement (p<0.01). Specifically, significant differences were found in the course grade between

clusters 3 and 5 (p=0.002). A chi-squared test found significant dependence among the course subject and the clusters $X^2(12) = 211.74$, $p<0.001$. Table 3 presents the cluster sizes, the average and standard deviation of the variables in each cluster, and the results of the ANOVA tests.

Table 3

Clusters by Learning Time During the Semester

Variables	Total population	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	F (4,582)
Size (percentage of the population)	N=587 (100%)	n=215 (36.6%)	n=114 (19.4%)	n=91 (15.5%)	n=90 (15.3%)	n=77 (13.1%)	
% of activity in quarter 1	22.88% (15.30%)	25.29% (6.95%)	11.88% (7.93%)	12.25% (9.20%)	17.48% (10.20%)	51.34% (12.89%)	279.81***
% of activity in quarter 2	21.07% (12.71%)	21.90% (7.33%)	15.82% (7.18%)	42.12% (10.76%)	11.39% (7.68%)	12.92% (7.79%)	220.95***
% of activity in quarter 3	23.56% (18.16%)	19.63% (10.62%)	48.47% (14.04%)	26.81% (16.83%)	8.32% (8.60%)	11.64% (10.18%)	179.89***
% of activity in quarter 4	25.92% (19.98%)	24.76% (12.72%)	17.82% (15.24%)	11.77% (11.15%)	60.07% (12.75%)	17.97% (12.37%)	201.14***
Course grade	84.05 (10.81)	86.12 (10.21)	83.44 (9.22)	81.15 (11.64)	83.88 (12.77)	82.83 (10.30)	4.02**

**p<0.01, ***p<0.001

Figure 1 provides a graphical presentation of the clusters and illustrates the different ways in which flexibility of learning time during the semester was used.

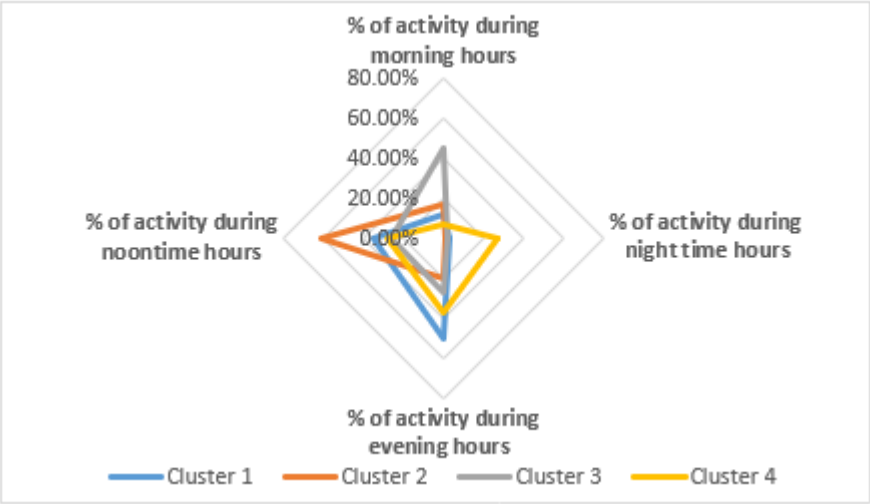

Figure 1. Patterns of use of the flexibility of learning time during the semester.

Regarding learning time during the week, analysis of the students' activity in the course websites revealed that they tended to be active to a similar extent on each day of the week. On average, a student was active on a specific day between 12% to 16% of his/her total days of activity in the course, with standard deviations ranging from 8% to 10%, per day. A cluster analysis did not yield any insightful results in identifying patterns of behavior during the week. Hence, Figure 2 displays the average of students' activity on each day of the week and the standard deviation.

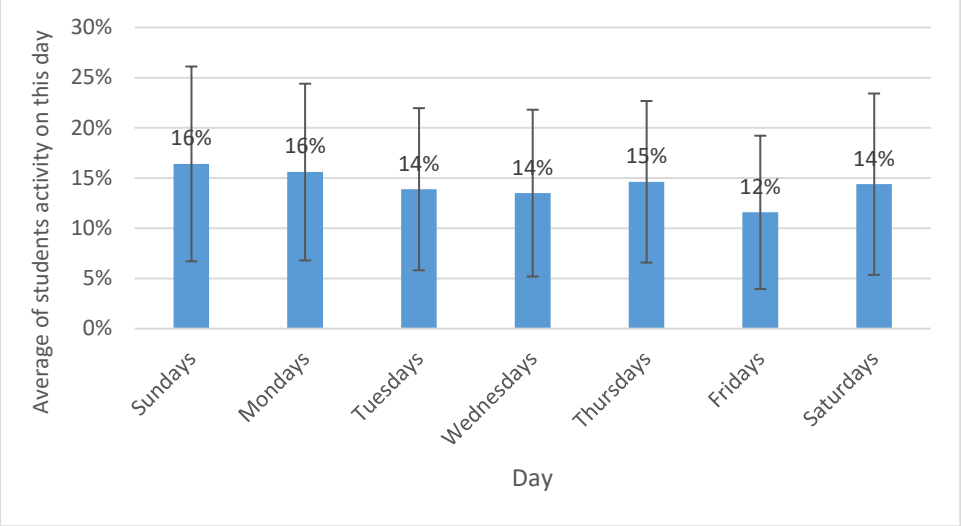

Figure 2. Average of students' activity on each day of the week and the standard deviation.

Regarding learning time during the day, analysis of the students' activity in the course websites revealed that students tended to be more active during the noon and evening hours than during mornings and nights. On average, a student performed 41% of his/her total activity in the course website during noon hours, 36% of his/her activity during evening hours, 18% during morning hours, and only 4% during night hours. The standard deviations ranged from 9% to 18% per time of day.

Using a cluster analysis, four patterns of behaviors were identified: (a) 44.8% (n=263) of the students performed a major part of their activity, 51% on average, during evening hours; (b) 31.3%, (n=184) of the students performed a major part of their activity, 61% on average, during noon hours; (c) 14.7%, (n=86) of the students performed 45% of their activity, on average, during morning hours; and (d) 9.2% of the students (n=54) performed 27% of their activity on average during night time hours. The silhouette measure of the model was 0.5. ANOVA tests showed statistically significant differences among the clusters in regard to all clustering variables (p<0.001) but not in regard to course achievement. A chi-squared test found no significant dependence among the courses and the clusters. Table 4 presents the cluster sizes, the average and standard deviation of the variables in each cluster, and the results of the ANOVA tests.

Table 4

Clusters by Learning Time During the Day

Variables	Total population	Cluster 1	Cluster 2	Cluster 3	Cluster 4	F (3,583)
Population size (%)	N=587 (100%)	n=263 (44.8%)	n=184 (31.3%)	n=86 (14.7%)	n=54 (9.2%)	
% of activity during morning hours	18.00% (14.73)	11.84% (7.74)	17.38% (10.07)	44.97% (11.62)	7.14% (6.75)	318.40***
% of activity during noon hours	41.36% (18.36)	35.01% (12.11)	61.44% (11.17)	25.87% (11.88)	28.59% (13.75)	266.46***
% of activity during evening hours	36.34% (18.30)	50.56% (13.05)	20.07% (9.14)	27.07% (14.82)	37.23% (12.48)	244.43***
% of activity during night time hours	4.30% (8.65)	2.59% (3.68)	1.11% (2.37)	2.10% (4.36)	27.04% (11.21)	467.52***
Course grade	84.05 (10.81)	84.33 (10.03)	84.10 (10.76)	84.13 (10.60)	82.41 (14.59)	0.47

***p<0.001

Figure 3 provides a graphical presentation of the clusters and illustrates the different ways in which flexibility of learning time during the day was used.

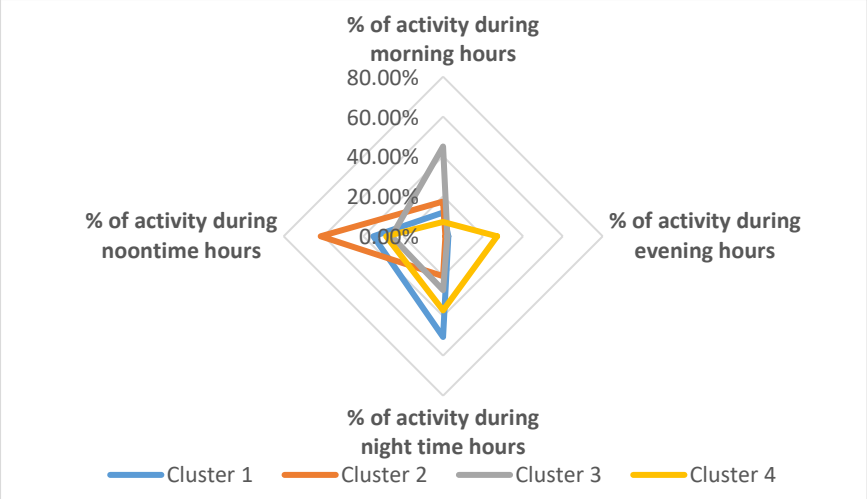

Figure 3. Patterns of use of the flexibility of learning time during the day.

Patterns of Students' Use of Flexibility of Learning Place

Regarding learning place, analysis of the students' activity on and off campus revealed that the students tended to be more active in the course off campus than on campus. On average, 85% of a student's activity in the course website took place off campus. The standard deviation was 18% and the median was 91%.

Patterns of Students' Use of Flexibility of Access to Learning Resources

Regarding number of accesses to the learning resources, analysis revealed that the students tended to re-access a learning resource more than once. On average, a learning unit was accessed 4.01 times, a course material was accessed 1.94 times, and a video lecture was accessed 1.85 times. The standard deviations ranged from 1 to 3.

Using a cluster analysis, three patterns of behaviors were identified: (a) most students, 70.2%, (n=412) tended to re-access all learning resources a few times (between 1.49 to 3.29 times, on average); (b) 18.6% (n=109) of the students tended to re-access the course materials more than the other students (3.56 times per item, on average); and (c) 11.2% (n=66) of the students tended to re-access the learning units and the video lectures more than the other students (7.97 times per learning unit and 4.20 times per video lecture, on average). The silhouette measure of the model was 0.6. ANOVA tests showed statistically significant differences among the clusters in regard to the clustering variables and the course achievement variable (p<0.001). Specifically, significant differences were found in the course grade between clusters 1 and 2, and between clusters 1 and 3 (p=0.036, p<0.001, respectively). A chi-squared test found significant dependence between the course subject and the clusters, $X^2(6) = 133.97$, p<0.001. Table 5 presents the cluster sizes, the average and standard deviation of the variables in each cluster, and the results of the ANOVA tests.

Table 5

Clusters by Number of Re-Accesses to the Learning Resources

Variables	Total population	Cluster 1	Cluster 2	Cluster 3	F (2,584)
Population size (%)	*N*=587 (100%)	*n*=412 (70.2%)	*n*=109 (18.6%)	*n*=66 (11.2%)	
Average accesses to a learning unit	4.01 (3.31)	3.29 (1.64)	4.33 (2.13)	7.97 (7.40)	71.21*** (0.19)
Average accesses to a course material	1.94 (1.03)	1.49 (0.55)	3.56 (0.87)	2.07 (0.88)	412.83*** (0.58)
Average accesses to a video lecture	1.85 (1.21)	1.50 (0.73)	1.78 (0.76)	4.20 (1.61)	268.69*** (0.47)
Course grade	84.05 (10.81)	82.46 (11.27)	88.94 (7.90)	85.91 (9.40)	17.49*** (0.05)

***$p<0.001$

Figure 4 provides a graphical presentation of the clusters and illustrates the different ways in which flexibility of re-accesses to learning resources was used.

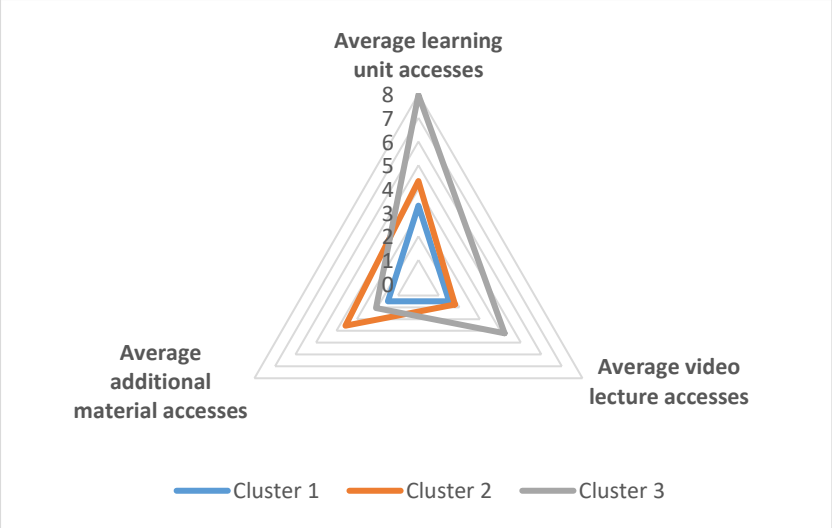

Figure 4. Patterns of use of the flexibility of re-accesses to learning resources.

Analysis of the order in which the students accessed the learning units is presented in Figure 5. The heat maps display, per course, the portion of students who accessed each learning unit during each week. The dashed lines symbolize assignment deadlines. Several trends emerged from the maps. It is notable (mostly in courses 1, 2, and 3) that, in general, most students followed the learning units linearly during the semester, entering a learning unit (or its adjacent units) on the corresponding week of the semester (e.g., entering learning unit 1 on week 1, learning unit 2 on week 2). However, in all courses there were smaller groups of students who entered other learning units as well. This is especially notable in course 1, where during each week students entered more advanced or preceding learning units, and in courses

2 to 4, where students entered mostly preceding learning units. Notably (mostly in courses 1, 2, and 3) more students entered the learning units during weeks with assignment deadlines. Finally, during the last two weeks of the semester, there was an increase in the number of students who entered all the learning units.

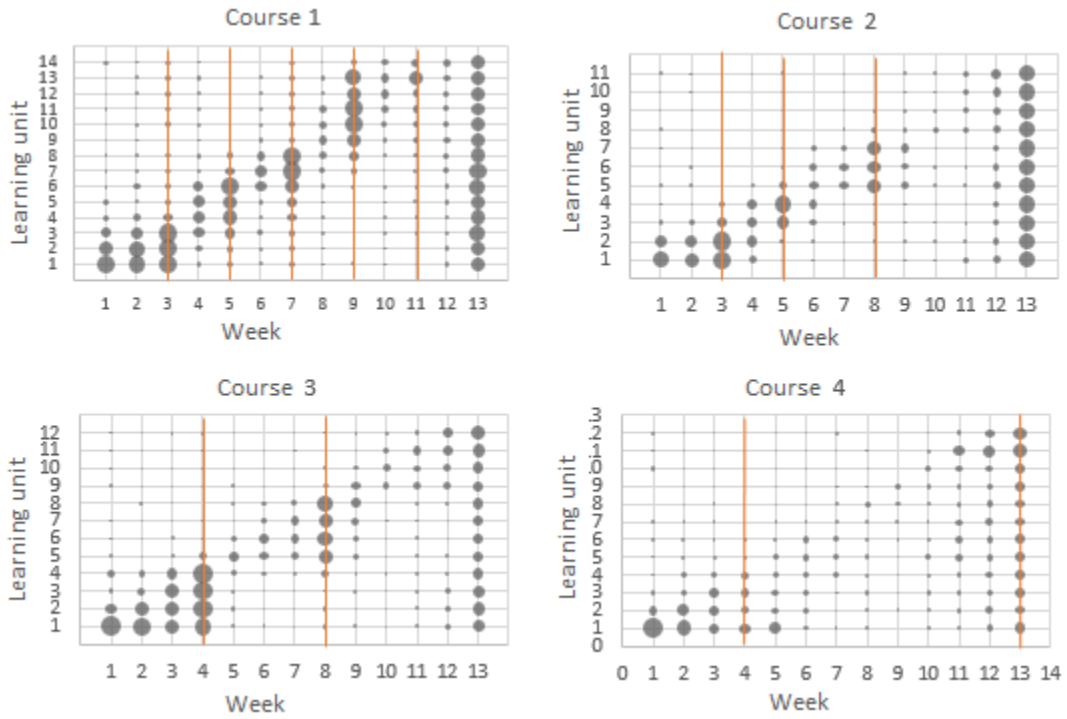

Figure 5. Use of the flexibility of order of access to the learning units.

Discussion and Conclusions

This study examined how students used the flexibility of time, place, and access to learning resources in four online academic courses, using educational data mining methodology. EDM reveals meaningful patterns of students' behavior based on their actual activity in the LMS. The results demonstrated that flexibility was used significantly, and provides evidence for the variety of ways students used it.

In regard to flexibility of learning time during the semester, various students made use of the flexibility dimension differently. Five clusters were found: the largest cluster (37%) is characterized by students who spanned their activity quite evenly over the semester. The other four clusters are characterized by students who invested more intense activity in one quarter of the semester than in the others. The differences in learning time during the semester among students are in line with previous studies, which indicated that one of the main goals in providing flexibility of time is to help people integrate learning into their often rather complex lives (Hill, 2006). Indeed, it was found that learning occurred at multiple times. However, some differences in the learning time could be related to the course structure, such as different number of assignments and deadlines during the semester.

As for the learning place and time during the week, it was found that most of the students (92%) learned mostly off campus, and tended to span their activity quite evenly over the days of the week, without

selecting a fixed day for learning. This may imply that the students divided their learning workload according to their timetables and needs. Regarding learning time during the day, as found in previous studies (Harasim, 2000), students made use of the opportunity to learn at all hours of the day. Four clusters were found: the largest cluster is characterized by students who tended to learn during the evenings (45%), followed by students who tended to learn during noon (31%). Only 15% of the students were significantly active in the mornings, and an even smaller group of students (9%) studied during the night. This may be related to students' other commitments, such as work.

In reference to flexibility of access to learning resources, while traditional learning environments typically require students to follow a linear sequence, online environments permit more flexibility by allowing learners to choose the sequence of learning as well as the amount of content they make use of (Hannafin, 1984; Reeves, 1993). Regarding the number of accesses to the learning resources, it was found that the students tended to use the possibility to re-access the learning resources. Three clusters were found: the majority of the students (70%) used the learning resources to a very limited extent, they re-accessed a learning resource between 1 to 3 times on average, whereas 19% of the students used it to a greater extent, specifically they accessed the learning units and the course materials between 3 to 4 times on average. The smallest cluster (11%) were students who used the learning resources the most. Specifically, they re-accessed the learning units and the video lectures between 4 to 8 times on average. The most re-accessed learning resources were the learning units, followed by the course materials and the video lectures. However, there were differences among the courses in this regard, which may be related to the characteristics of the course content, such as the level of difficulty of the learning resources and their importance to the course. For example, in one course, the course materials consisted of a digital textbook, which accompanied all learning units and constituted an integral part of the course. Some courses contained a dictionary, which was essential throughout the course, and so on.

As for the sequence of access to the learning resources, although all learning units were available from the beginning of the course, the vast majority of students followed through them linearly as the semester progressed. The linear trend is not completely surprising given the structure of the courses. Nevertheless, smaller groups of students accessed all the learning units all through the semester, which indicates that they may have used the possibility to access contents according to their preferred order and pace. In general, this pattern emerges in all four courses, but differently. Possible reasons may include different structures of course content, which in some courses may not have required linear sequencing of learning. Interestingly, there was higher students' engagement in courses with more assignments (Course 1 compared to Course 4). In all of the courses, engagement increased during weeks with assignments and towards the date for the final exam. These results emphasize that integrating scaffolding, such as assignment deadlines, can increase students' engagement.

Exploring the relation between use of flexibility and course achievement revealed significant differences among students who used the flexibility of learning time during the semester and access to learning resources differently. Interestingly, students who spanned their activity evenly over the semester quarters scored higher on average than those who tended to centralize part of their activity in one quarter. Notably, students who were more active towards the date for the final exam achieved higher grades. Moreover, students who tended to re-access the course content also achieved higher grades in the course. These findings are in line with previous research, which found a significant relationship between active participation in online courses and academic performance, and which indicated that success in online courses requires regular study during the course (You, 2016). It should be noted that course achievement was not found to be related to learning hours or places.

To summarize, this study found that most students adapted different patterns of flexibility use in learning time, place, and access to learning resources. This emphasizes that integrating flexibility in online courses enables students to learn according to their needs. Moreover, the results of this study indicate that the ways students use flexibility are related to their achievement. Specifically, the way students span their learning over the semester, as well as their level of engagement with the course content, are both related to achievement. This study contributes to the body of knowledge about flexible learning by analyzing students' behavior using EDM, and providing evidence for the ways in which students use flexibility. Practically, it may support course designers in developing flexible online courses according to students' preferences, while taking achievement into account. This could be done by providing suitable scaffolding for increasing students' engagement with the learning resources (such as assignments) along the semester and towards the end of the course. Furthermore, this analysis can increase collaboration among students with similar characteristics (e.g., same learning time, course content).

Limitations and Implications for Future Research

Several possible limitations should be noted. This study examined four online courses with a dedicated instructional course model. Future research should examine a larger sample of courses from diverse disciplines and a more heterogeneous population. Moreover, since a dependency was found among the courses and the clusters, further research to take a closer look into each course would be interesting. In addition, despite the differences that were found among different patterns of students' use of flexibility and course achievement, conclusions regarding causality should not be derived. Hence, further research should include a wider range of variables which could affect the use of flexibility, such as demographic factors. In addition, future research to examine the use of other flexibility dimensions, such as the duration of learning, may be worthwhile. Finally, the study relied solely on a data mining approach, which focused mainly on students' activities in the online environment. This approach disregards offline activities as well as students' perceptions and motivations. Thus, further research could use other reasearch methodologies (e.g., interviews with students, surveys) in order to shed light on the different patterns of flexibility usage that were found and obtain a more holistic understanding.

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Research on MOOCs in Major Referred Journals: The Role and Place of Content

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Abstract

Over the last decade, several studies have focused on massive open online courses (MOOCs). The synthesis presented here concentrates on these studies and aims to examine the place held by content in these studies, especially those produced between 2012 and 2018: sixty-five peer reviewed papers are identified through five major educational technology research journals. The analysis revealed that these research articles covered a wide diversity of content. Content was mainly defined in terms of objectives of MOOCs, prerequisites required for participation in the MOOC, types of learning scenarios, and, though rarely, through the strategies used to convey content. In addition, empirical studies adopted a variety of conceptual frameworks which focused mainly on learning strategies without relating to the content in question. Finally, content was seldom considered as a research object. These results can provide MOOC researchers and instructors with insights for the study and design of MOOCs by taking into account the specificity of their content.

Keywords: MOOC, research review, didactics, content

Introduction

The rise of MOOCs[1] is part of an unprecedented development of collaborative teaching and learning practices based on the intensive use of connected technologies. This growth is concomitant with a context of massification of university education where MOOCs are perceived as able to promote personal and social emancipation, as well as lifelong learning, particularly for those who are unable to attend universities regularly to follow a face-to-face curriculum. Following up on learners in these open and massive training systems benefits from the development of tools and methods for systematic text mining, automatic language processing, and recommendations generation combining user profiles, content descriptions, classification, filtering, trace analysis, and so on.

In this context of rapid change, academic institutions, mainly in the United States and Europe, have enthusiastically committed to supporting MOOCs to diffuse a large variety of content to a wide range of audiences. Nevertheless, the original idea that raised high expectations on the part of university training institutions, that of the potential for innovation and openness, has been transformed into a mechanistic strategy aiming at increasing the number of MOOC participants. Great difficulties prevent the transformation of the pedagogical discourse around MOOCs into relevant pedagogical practices. One of the main difficulties seems to be the naturalization of the principles underlying the elaboration, transmission, and construction of the content being conveyed.

This context has raised and guided several studies of MOOCs, a form of teaching and learning that is dynamic and experiencing rapid growth. This is evidenced by the production of multiple literature reviews since 2008, published in journals specializing in educational technologies (Bozkurt, Akgün-Özbek, & Zawacki-Richter, 2017; Davis, Chen, Hauffand, & Houben, 2018; Ebben & Murphy, 2014; Gašević, Kovanovic, Joksimovic, & Siemens, 2014; Israel, 2015; Jacoby, 2014; Kennedy, 2014; Liyanagunawardena, Adams, & Williams, 2013; Nortvig & Christiansen, 2017; Paton, Fluck, & Scanlan, 2018; Raffaghelli, Cucchiara, & Persico, 2015; Rolfe, 2015; Veletsianos & Shepherdson, 2015, 2016; Yousef, Chatti, Schroeder, Wosnitza, & Jakobs, 2014; Zawacki-Richter, Bozkurt, Alturki, & Aldraiweesh, 2018; Zhu, Sari, & Lee, 2018).

These research reviews have highlighted the fact that MOOCs have been analysed both in terms of design and from the perspective of scientific knowledge production. Two objectives emerge from the previous research. On the one hand, some of these studies sought to undertake a comprehensive analysis in order to take stock of the studies at a specific moment (Bozkurt et al., 2017; Ebben & Murphy, 2014; Gašević et al., 2014; Liyanagunawardena et al., 2013; Veletsianos & Shepherdson, 2016; Yousef et al., 2014; Zawacki-Richter et al., 2018). The first study on MOOC research trends, by Liyanagunawardena et al. (2013), reviewed 45 published MOOC studies (published between 2008 and 2012) in order to identify the themes of the MOOCs and the phases of their evolution. One year later, Ebben and Murphy (2014) examined empirical studies (published between 2009 and 2013) to determine the themes in MOOC research in two phases, titled "Connectivist MOOCs, Engagement and Creativity, 2009–2011" and "xMOOCs, Learning Analytics, Assessment and Critical Discourses about MOOCs, 2012–2013." Around the same time, Yousef et al. (2014) reviewed 84 MOOC studies to gain a deep understanding of key concepts in this emerging field. Gašević et al. (2014) outlined the specific finding of an analysis of the research proposals submitted to the MOOC Research Initiative (MRI) funded by the Gates Foundation and administered by Athabasca University. Furthermore, Veletsianos and Shepherdson (2016) reviewed 183 empirical MOOC papers published between 2013 and 2015 in

order to explore the geographical distribution, research components, article citations, and research methodologies of MOOC studies.

The following year, Bozkurt et al. (2017) conducted a systematic review of 362 empirical articles with the aim of identifying trends and patterns in research on MOOCs (2008 to 2015). Similar to this research, but with a different scope, Zawacki-Richter et al. (2018) published another review using a text-mining tool to analyse the titles and abstracts of publications in academic journals. On the other hand, other studies sought to focus on a specific theme or a particular issue: (a) taking stock of the characteristics attributed to MOOCs such as openness or retention (Kennedy, 2014); (b) examining collaboration between educational institutions on MOOCs launched in Europe and in the US for the previous 10 years (Nortvig & Christiansen, 2017); (c) analysing the literature on MOOC learner retention and engagement from a vocational education and training perspective (Paton et al., 2018); (d) exploring innovations in scalable learning strategies (strategies that engage students in the process of learning through activities and/or discussion in class) that aim to create a more active learning experience (Davis et al., 2018); (e) questioning the so-called disruptive innovation nature of MOOCs in training or certification programmes and the economic models adopted (Jacoby, 2014); (f) questioning the social and ethical dimensions of MOOCs (Rolfe, 2015); (g) summarising the studies that focused on the environments that integrate MOOCs into traditional classes/courses (Israel, 2015); (h) reporting on the methodological approaches adopted in the scientific literature on MOOCs (Raffaghelli et al., 2015; Zhu et al., 2018); and (i) analysing the interdisciplinary nature of research on MOOCs (Veletsianos & Shepherdson, 2015).

These literature reviews provide a valuable synthesis of trends and patterns in research on MOOCs. However, given that content constitutes a core component of MOOCs, it would be beneficial to investigate how it is questioned and analysed. Some literature reviews examined the learning process in MOOCs such as Lee, Watson, and Watson (2019) who conducted a systematic review of empirical research on self-regulated learning strategies in MOOCs or Wong (2016), who examined the literature covering the characteristics of teaching in MOOCs, the profile of participants, the instructional design of course materials, and/or the course assessment methods. However, the literature concerned with MOOC content needs to be explored in order not only to reveal the various content areas covered by empirical studies, but also to better understand the research issues about content and determine the gaps in the research so as to address them in the future.

Thus, the objective of this review is to provide a more comprehensive study of the literature related to MOOC content by scrutinizing the articles published in peer-reviewed journals between January 2012 and January 2018. More specifically, this literature review will attempt to respond to the following research questions: What are the content areas covered by empirical studies of MOOCs? How was content defined in the analysed research? Do the adopted conceptual frameworks take into account the specificity of the content conveyed by MOOCs? Does the content conveyed by the MOOCs analysed constitute a fully-fledged research object and if so, how?

Research Methodology

Selecting Journals and Articles

Five major referred journals were reviewed for this study. We selected journals based on their five-year h-index and h-median Google Scholar metrics. Among the five journals selected are the four journals considered top publications in the educational technology field. Based on the research methodology adopted by Nikou and Economides (2018) who focused on mobile-based assessment, we searched the journals in Google Scholar's main category of social sciences, within the subcategory educational technology. Figure 1 shows these four top journals with their h-index and h-median.

Categories > Social Sciences > **Educational Technology**

	Publication	h5-index	h5-median
1.	Computers & Education	91	152
2.	British Journal of Educational Technology	57	79
3.	The International Review of Research in Open and Distributed Learning	46	64
4.	The Internet and Higher Education	45	88

Figure 1. The top four educational technology research journals in 2019.

We added the journal *Distance Education* since it is considered one of the five key journals in Scopus that publishes research related to MOOCs (Zhu et al., 2018). Hence, the journals selected for this review are *Computers & Education (CAE)*, *British Journal of Educational Technology (BJET)*, *The International Review of Research in Open and Distributed Learning (IRRODL)*, *The Internet and Higher Education (IHEDUC)*, and *Distance Education (DE)*. These journals are all ranked in the first quartile (Q1) in the SCImago Journal Rank (SJR) indicator. Table 1 shows their SJR (SCImago) and impact factors (2019 Clarivate Analytics, Journal Citation Reports).

Table 1

Characteristics of the Selected Journals

Journal	SJR (2017)	JCR (2017)
BJET	1.34	2,729
CAE	2.63	4,538
DE	0.7	1.314
IRRODL	1.26	1,826
IHEDUC	3.35	5,847

We then selected articles published in one of the five selected journals (*CAE, BJET, IRRODL, IHEDUC, DE*) according to three criteria: (a) published between January 1, 2012 and January 1, 2018; (b) dealing explicitly with MOOCs, so that the keyword MOOC(s) or massive open online course(s) must be in the title or abstract; and (c) written in English.

The year 2012 was selected as a starting point since it was considered as the "Year of the MOOC" by the New York Times (Canbek & Hargis, 2015). In order to select only articles that correspond to our research goals, criteria were applied in two stages. In the first stage, we excluded: (a) studies that failed to provide precise research questions or objects of research and methodologies; (b) papers oriented towards engineering that addressed topics such as software development, software engineers, and platform development, return of experience or expertise (which focused on MOOCs design and participant satisfaction); (c) doctoral theses and books; and (d) articles not reporting empirical research.

To complete the selection phase, the three members of the research team read the abstract of each article so as to consider only empirical research. If no decision could be made by examining the abstract, the full paper was examined. Previous research reviews (12 articles) were also retained in order to provide some insights into the trends already observed in the literature. The researchers then independently validated the inclusion/exclusion criteria for each article. The intercoder agreement rate for coding was 92.30%. The result was 65 articles which fit the criteria above (53 empirical research articles and 12 research reviews). Table 2 shows the distribution of the articles that were found to be relevant for this study in the selected top journals. Table 2 reveals that most articles were published in *The International Review of Research in Open and Distributed Learning* (n=27) followed by *Computers & Education* (n=13), *Distance Education* (n=9), *British Journal of Educational Technology* (n=8), and *The Internet and Higher Education* (n=8).

An in-depth analysis of the 65 articles was undertaken on the basis of an analytical framework that facilitated data coding. The grid included both multiple-choice and open-ended questions (19 items) and had four sections: (a) writing characteristics (i.e., references, authors' affiliation, authors, field of study, type of document, nature of document); (b) conceptual framework adopted (i.e., theoretical foundations, research concepts, questions, objectives); (c) information on the empirical elements of the research (i.e., data collection method, data processing method, and key findings); and (d) the role of the training content analysed, namely whether or not it was an object of research.

Analysis Method

Using a thematic content analysis technique (Hasni et al., 2016), the analysis was carried out through the following two steps. First, for each item in the grid, excerpts identified in all of the articles were collected and read repeatedly by the analysts in order to propose thematic categories. Then, the excerpts were divided into units of meaning, that is, shorter segments of text that can be associated with a category. For example, for research in which the question "What did learners perceive as the most impactful instructional strategy in the MOOC?" (Watson, Kim, & Watson, 2016) is considered as a unit of meaning, the three raters assigned this research question to the thematic category labelled learning experience. While the research question "What are the self-regulated learning strategies that characterize MOOC learners?" (Costley & Lange, 2017) was assigned to the category "learning process." Determining inter-rater agreement allowed for checking that each category was associated with the proper thematic types. We note that the categories must be explicit and mutually exclusive (i.e., each

unit of meaning must only fall under one category), and they must make sense in terms of research in the field.

Research on Content Conveyed by MOOCs

Content Areas Covered by Empirical Studies

The content in the MOOCs analysed in the selected studies fell into three categories: humanities and social sciences, science and technology, and information and communication sciences. A wide variety of content was described in these empirical studies. Tables 2, 3,4 show that the content in the field of humanities and social sciences focused on education, sociology, art and design, policy, business and economics, and psychology. The science and technology category included mathematics, biology and medical sciences, chemistry, computer sciences, and engineering content. The content in the field of information and communication sciences focused on personal learning environments, networks, and knowledge creation and generation. The most frequently covered content categories were science and technology (52.5%), followed by social science, education, and humanities (45%), and information and communication sciences (2.5%).

Table 2

Content Category Social Science, Education, and Humanities

Category	Thematic types	Articles
Social science, education, and humanities (45%)	Education	(Almatrafi, Johri, & Rangwala, 2018; de Lima & Zorrilla, 2017; Kizilcec, Pérez-Sanagustín, & Maldonado, 2017; Rohs & Ganz, 2015)
	Sociology	(Soffer & Cohen, 2015; Watson, Watson, Yu, Alamri, & Mueller, 2017; Watson, Watson, Richardson, & Loizzo, 2016)
	Art and design (creative writing and reading, journalism, and poetry)	(Ashton & Davies, 2015; Chen & Chen, 2015; Hew, 2016; Huisman, Admiraal, Pilli, van de Ven, & Saab, 2018; Kwak, 2017; Phan, McNeil, & Robin, 2016;Yang & Su, 2017)
	Business and economics	(Kizilcec et al., 2017)
	Psychology	(Henderikx, Kreijns, & Kalz, 2017; Watson, Watson, Yu, Alamri, & Mueller, 2017; Zhang, Skryabin, & Song, 2016)

Note. One study may cover more than one content category.

Table 3

Content Category Science, Technology, and Mathematics

Category	Thematic types	Articles
Science, technology, and mathematics (52.5%)	Mathematics	(Firmin et al., 2014; Kellogg, Booth, & Oliver, 2014; Rieber, 2017; Wise, Cui, Jin, & Vytasek, 2017)
	Biology and medical sciences	(Almatrafi et al., 2018; Engle, Mankoff, & Carbrey, 2015; Jiang, Williams, Warschauer, He, & O'Dowd, 2014; Kahan, Soffer, & Nachmias, 2017; Milligan & Littlejohn, 2016; Soffer & Cohen, 2015; Watson, Kim, et al., 2016; Watson, Watson, Janakiraman, & Richardson, 2017; Wise et al., 2017)
	Physics and chemistry	(Formanek, Wenger, Buxner, Impey, & Sonam, 2017; Watted & Barak, 2018)
	Computer Sciences (programming and databases)	(Alario-Hoyos, Estévez-Ayres, Pérez-Sanagustín, Kloos, & Fernández-Panadero, 2017; Andersen & Ponti, 2014; Hew, 2016; Littlejohn, Hood, Milligan, & Mustain, 2016; Liyanagunawardena, Lundqvist, & Williams, 2015)
	Engineering	(Kizilcec et al., 2017; Watted & Barak, 2018)

Note. One study may cover more than one content category.

Table 4

Content Category Information and Communication Sciences

Category	Thematic types	Articles
Information and communication sciences (2.5%)	Personal learning environment, networks and Knowledge creation & generation	(Wang, Anderson, Chen, & Barbera, 2016)

Content Definition in Empirical Studies

In order to reveal the content conveyed by the MOOCs on which the research studies focused, we analysed the objectives and tasks underlying these MOOCs and the manner in which the content was conceptualised (or not). While content has not been considered as a central research issue, the objectives of the course and learners' roles were often presented or mentioned in the identified research. Objectives were formulated in terms of the knowledge and skills learners were to acquire. For example, in the Mathematics Learning Trajectories MOOC-Ed series, the MOOC titles *Equipartitioning* (Kellogg et al., 2014) dealt with the interpretation and implementation of core standards in mathematics. Soffer and Cohen (2015) explicitly set out the main objectives of a MOOC intended to introduce plant biology, and titled *What a Plant Knows and Other Things you Didn't Know About Plants*. The objectives of the MOOC *Fundamentals of Clinical Trials* analysed by Milligan and Littlejohn (2016) were explained in terms of the appropriation of concepts (the scientific, statistical, and ethical aspects of clinical trials research) and how the results of clinical trials are interpreted. Objectives were also formulated in terms of the soft skills or behaviours to be acquired, as in the *Human Trafficking* MOOC (Watson, Watson, Richardson, et al., 2016), the objective of which was to change learners' attitudes and motivate them to combat human trafficking. The *Animal Behaviour & Welfare* MOOC (Watson, Kim, et al., 2016) was designed to help students recognise that animal welfare is at the crossroads of several disciplines, such as ethics, sciences, law, and so on. The *Change 11* MOOC (Wang et al., 2016) sought to introduce and encourage interaction in the field of educational technology.

Content was also defined through the prerequisites required for participation in the MOOC. Although the MOOCs we analysed were of broad public interest and were open to all, a few MOOCs specified that some prerequisites were required before one could begin the course. For instance, the study by Engle et al. (2015) specified that the MOOC *Introductory Human Physiology* was designed to teach physiology to students enrolled in biomedical engineering. Littlejohn et al. (2016) also specified that to begin the *Introduction to Data Science* MOOC, learners required some basic knowledge (i.e., intermediate programming experience and some form of familiarity with databases). Wise et al., (2017) stated that to begin the "Statistical Learning (StatLearn)" MOOC, the necessary prerequisites included statistics, linear algebra, and computer science. Other studies indicated that certain MOOCs were addressed to a public with a specific professional level. The *Planning for the Digital Learning Transition* MOOC was designed for the professional development of K–12 teachers. The "Stat 95, Elementary Statistics" MOOC was primarily destined for decision makers in the fields of education and nursing, and for

administration personnel, psychologists, and sociologists; moreover, it required the satisfaction of ELM or math remediation, and two years of high school algebra (Firmin et al., 2014).

Learner roles and teaching scenarios also helped define the content of the MOOCs analysed. Learner roles were often structured as learning tasks and the resources required to complete these tasks. Tasks were set to achieve the objectives set in each teaching unit and as assessment tasks which helped ensure that objectives were met. Therefore, according to Phan et al. (2016), the pMOOC *Digital Storytelling* presented learning acquisition tasks consisting of watching digital stories on video platforms and a peer assessment activity in the form of students' mini projects produced and submitted each week, based on the topics created by the instructor.

Finally, content was defined through the strategies used to convey content (Hew, 2016). Indeed, for each MOOC (i.e., *Python Programming* and *Poetry and Design*), the author pointed out the strategies that can be used for each of the following factors: (a) problem-oriented learning with clear and comprehensive expositions rather than teaching a topic/concept in isolation, (b) instructor accessibility and passion, (c) peer interaction, (d) active learning using projects, and (e) course resources to address participants' learning needs.

Conceptual Frameworks to Analyse the Content Conveyed by MOOCs

Researching the issue of content in MOOCs can also be carried out by looking at the various conceptual frameworks mobilized in MOOCs. Indeed, in order to answer the multiple research questions noted, the empirical studies undertaken adopted a variety of conceptual frameworks. Among the articles that have adopted these conceptual frameworks (28/53); 21 of these were explicitly presented and the other 7 were identifiable through the text. The rest of the articles (25/53) did not state their conceptual framework. Table 5 shows that the conceptual frameworks refer mainly to learning theories such as self-regulation and social learning strategies (Milligan & Littlejohn, 2016; Zhou, 2016) without taking into account the specificity of the content being conveyed (e.g., mathematics, sciences, technology, literature).

Table 5

Conceptual Frameworks Mobilized

References	Conceptual framework mobilized
(Andersen & Ponti, 2014)	Social interaction in the learning process (Dysthe, 2001; Säljö, 2001). Zone of proximal development (Engeström, 1987). Mutual development (Andersen & Mørch, 2009).
(Chen & Chen, 2015)	Self-determination theory (Deci & Ryan, 1985, 2002).
(Kellogg et al., 2014)	Connectivist learning theory (Siemens, 2005). Classification of the process of network formation (Rivera, Soderstrom, & Uzzi, 2010).
(Milligan & Littlejohn, 2016)	Self-regulated learning (Zimmerman, 2000).
(Kizilcec et al., 2017; Littlejohn et al., 2016)	Connectivist learning theory (Siemens, 2005). Self-directed learning (Barnard-Brak, Paton, & Lan, 2010). Learner engagement (Milligan, Littlejohn, & Margaryan, 2013; Andersen & Ponti, 2014).
(Phan et al., 2016)	Instructional design (Dick, Carey & Carey, 2009).
(Wang et al., 2016)	A framework for interaction and cognitive engagement in a connectivist learning environments (Wang, Chen and Anderson, 2014).

Note. Conceptual frameworks of the other 20 articles are presented in the appendix.

Content Conveyed by MOOCs as a Fully-Fledged Research Object

Before focusing on the issue of content as research object, we provide an overview of the recurring research objects in previous research on MOOCs. In the 53 selected empirical articles, we identified four categories of research objects: (a) the learning process, (b) learning experiences, (c) predictors of retention, and (d) the design of MOOCs. We illustrate only the first category regarding its relevance to our perspective.

Categories of research objects. With regard to the learning process, two subcategories of research objects were identified: the determinants of learning, and interactions in the MOOCs. For instance, the research questions addressing the determinants of learning included how participants self-regulated their learning (Alario-Hoyos et al., 2017; Kizilcec et al., 2017; Littlejohn et al., 2016; Milligan & Littlejohn , 2016), people's motivations for participating or learning in a MOOC (Milligan & Littlejohn, 2017; Rieber, 2017; Shapiro et al., 2017; Stich & Reeves, 2017), and the learner behaviour in the course (de Lima & Zorrilla, 2017; Kahan, Soffer & Nachmias, 2017). Articles focusing on interactions

in MOOCs examined the modes of discussion that characterised the participation of learners in forums (Gillani & Eynon, 2014; Zhang et al., 2016), the modes of communication offered to learners, namely asynchronous or synchronous (Li et al., 2014), the processes of interaction between users and organisers in the case of cMOOCs (Andersen & Ponti, 2014), or the modes of interaction and their role in the co-construction of new knowledge (Kellogg et al., 2014). As can be seen by these various studies, one does not question whether or not (and if so, how) the content specifies the learning process and/or interactions.

The same observation could be made regarding the other three categories of research objects. Content is seldom taken into account for analysing types and conditions of MOOC designs (Henderikx et al., 2017; Soffer & Cohen, 2015; Walji, Deacon, Small, & Czerniewicz, 2016), predictors of retention as an emotional state, learning strategies (Engle et al., 2015; Firmin et al., 2014; Rohs & Ganz, 2015), or the experience of students by examining the self-assessment of their progress and the various difficulties encountered in MOOCs (Chen & Chen, 2015).

Content as a research object. As presented in the section above, the content conveyed by MOOCs is identifiable through the objectives, requirements, tasks, teaching scenarios, and resources of specific MOOCs, though rarely by way of learning strategies used to convey content. Thus, the content was often placed in the background, as a context of the study, along with other components such as evaluation, certification, and technological features. However, among the 53 empirical studies, 8 articles addressed the content of the MOOC as an object of research in its own right, meaning that at least one research question focused directly on content. Among these is the study conducted by Wise et al. (2017) who highlighted the difficulty of learners in a MOOC on statistics to distinguish between discussion forums in line with the course content and those whose content was unrelated to the course. Posts related to the content were those that sought/provided assistance, information, or resources directly related to the course subject. These included posts that asked or responded to questions related to the topic, to ideas related to the topic, and to comments on external resources. However, posts unrelated to the content addressed logistical and technical subjects. Wise et al. (2017) thus analysed the possibilities of using the linguistic characteristics of posts to distinguish them. They came to the conclusion that the linguistic model for classification that distinguishes the posts related to the content from those unrelated to content can be generalised to other statistics courses, even though they considered that the model would be less efficient in other areas. Similarly, Almatrafi et al. (2018) aimed to facilitate instructors' role in MOOCs. More specifically, this study sought to assist them in navigating students' posts in MOOC discussion forums in a more efficient and effective way. The study examined the possibility of building a model that can identify urgent posts in MOOC discussion forums. The authors then used linguistic features metadata to classify posts and identify urgent ones in MOOC forums. They concluded that this model can be used by instructors to accord priority to the urgent messages. Content was also designed as an object of research by Andersen and Ponti (2014) who analysed the co-creation of content by peers in MOOCs within the framework of a peer-to-peer university. By viewing learning as social interaction and as a zone of proximal development and mutual development, these authors analysed the interactions among participants in an open education course and questioned what this interaction involved, especially in terms of learning. Watson, Watson, Richardson, et al. (2016) distinguished the roles played by designers and facilitators in a MOOC and examined learners' actual experiences with regard to a given content topic, that of human trafficking, and a specific goal, namely to transform participants' attitudes in relation to the subject studied. They also examined participants' learning experience in the light of attitude change. According to these

authors, designing and facilitating a course in order to transform learners' attitudes requires instructors to establish cognitive, affective, and behavioural dissonance. They examined (from the perspective of learners, instructor, and instructional designer) the instructional design and facilitation of a MOOC designed to change attitudes on the social topic of human trafficking. Specifically, they analysed learners' perceptions to determine whether the instructional strategy—general, cognitive, affective, or behavioural—enabled attitude change. In the same way, Watson, Watson, Janakiraman, et al. (2017) examined instructors' use of social presence, teaching presence, and attitudinal dissonance in a MOOC titled "Animal Behavior and Welfare." From a learner's perspective, Kizilcec, Pérez-Sanagustín, and Maldonado (2017) explored the manner in which self-regulated learning (SRL) strategies are adopted by learners to interact with course content. The authors investigated this manifestation of SRL along two levels: level of individual transitions (such as revisiting an assessment after passing an assessment) and per-session activity (such as total time spent revisiting content). Veletsianos et al. (2015) identified the factors that shaped the ways participants used MOOC content. Based on learners' interactions in social networks outside of the MOOC platform, the authors found that the ways in which learners consumed MOOC videos were driven by personal and environmental factors. The design of each course seemed to impact the way participants used MOOC content. According to the authors, learners interact with content in multiple modes (e.g., video, digital transcript) and in different modalities (e.g., pausing and replaying videos, taking notes, reviewing printed transcripts).

But the clearest example of considering content as a research object is illustrated by Kwak (2017), who analysed how MOOC instructors teach academic writing. More specifically, Kwak (2017) examined the different approaches revealed within the methods in MOOCs designed for teaching writing. The author found that academic writing MOOCs rely on a traditional model of transmitting the writing content; most current writing MOOCs still focus on teaching and learning about textual structures (e.g., textual features, forms, correctness) rather than adopting the more extensive perspective of written language as social context (e.g., broader contexts of writing, social forces, power relations, critical awareness).

Table 6 summarises the different ways in which content was considered as a research object.

Table 6

Research Articles That Considered Content as an Object of Research

Research article	Examples of research questions focused on content
(Almatrafi et al., 2018)	Can linguistic features such as term frequency and features extracted from a linguistic tool along with some metadata identify reliably urgent posts in MOOC forums?
(Andersen & Ponti, 2014)	What processes of interaction occur in an online open educational course?
(Kizilcec et al., 2017)	How do self-reported SRL strategies manifest in interactions with course content?
(Kwak, 2017)	What approaches are revealed within the teaching methods in writing MOOCs: Traditional model of content transmission vs more extensive perspectives?
(Veletsianos et al., 2015)	What factors shaped the ways that participants consumed MOOC content?
(Watson, Watson, Richardson, et al., 2016)	How did a MOOC instructor establish social presence, teaching presence, cognitive dissonance, affective dissonance, and behavioral dissonance to facilitate attitude change around the social issue of human trafficking?
(Watson, Watson, Janakiraman, et al., 2017)	How did a MOOC instructor establish social presence, teaching presence, cognitive dissonance, affective dissonance, and behavioral dissonance to facilitate attitude change around the social issue of animal behaviour and welfare?
(Wise et al., 2017)	Do starting posts of content-related threads in a statistics MOOC discussion forum have linguistic features that distinguish them from starting posts of non-content-related threads?

Discussion

In the following, the results corresponding to each research question are briefly discussed. First, a wide diversity of content was covered by research articles on MOOCs as highlighted by a number of studies (Pappano, 2012; Riyami, Mansouri, & Poirier, 2016). For instance, Pappano (2012) stated that Coursera offers a wide range of courses, from computer science, to philosophy, to medicine. This finding can be explained by the fact that platforms and features of MOOCs advance quickly, allowing several new types of content to be integrated into MOOCs (Cisel & Bruillard, 2013). Our results also determined that science, technology, and mathematics, as well as social science, education, and humanities were the content categories covered most, which corresponds with findings from Pundak, Sabag, and Trotskovsky (2014). Second, content was mainly defined in terms of MOOCs' objectives, prerequisites required for participation in the MOOC, teaching scenarios, and, rarely, through strategies used to convey content. Furthermore, content was defined with regard to knowledge, skills, and behaviours to

be acquired, learning tasks, and the MOOCs' resources. Nevertheless, these research articles did not describe other categories of content such as values, practices, and relationships between an individual and a situation or an environment (Delcambre, 2013). Despite the fact that content can be a relational or transactional object (Fluckiger & Reuter, 2014), we noted that it was not defined, described, or even delimited by making reference to theoretical spaces, disciplines, or even learning actors, such as deducing the manner in which learners understand content from their interactions with the MOOC,. Also, no studies seem to have specified, for example, what they mean by programming content, digital technology content, and so on. Third, analysis of the conceptual frameworks mobilized clearly reveals a paucity of studies on the fate of the content created and transmitted in MOOCs. Although the conceptual frameworks used in the empirical studies focused on learning strategies (metacognitive and cognitive strategies), they did not relate these to the content in question. Fourth, our study highlighted that content is rarely considered as a research object in its own right. In the few articles that addressed content as research object, two orientations can be distinguished. On one hand, the content is analysed from how its transmission conditions are designed, such as presenting, interacting with content, or facilitating its transmission. On the other hand, the research deals with the correspondence between content (e.g., linguistic features of content, participants' pre-existing knowledge, beliefs, and attitudes) and the features of MOOC as transmission media. However, these research articles do not explicitly consider theoretical perspectives centered on knowledge, for instance, modeling the content's disciplinary structure, or the cognitive levels required to learn content through a MOOC. Such theoretical perspectives would ask questions regarding what disciplinary knowledge structure and what knowledge, skills, and abilities are required to learn a specific content (Svinicki, 2010). Furthermore, the learning difficulties concerning a specific content are not tackled. Indeed, only one research article identified the various difficulties encountered by participants learning the abstract concepts of Javascript programming (Andersen & Ponti, 2014). As a result, future research can consider dealing with the difficulties experienced by MOOC participants when learning specific content. However, we have shown that a great deal of research is focused, generally, on the learning process. This was emphasised by Raffaghelli et al. (2015) who outlined that massive courses are based not only on learners' self-regulation strategies, but also on their interaction with peers.

Conclusion

The research review presented here reveals several issues related to the research on content conveyed by MOOCs and offers a possible path for future research. But it has several limitations. The findings of our study are limited to searching using the keywords MOOC(s) or massive open online course(s), in articles published in English between January, 2012 and January, 2018. Furthermore, the scope of our study was intentionally limited to include five top educational research journals. Future work could consider a broader scope by including recent conferences, theses, and books using databases to allow for further analysis of global trends in research on MOOCs.

However, in both the literature reviews and the empirical articles presented previously, it seems that the content of MOOCs is little investigated in MOOC research. In particular, most MOOC research focused on the learning process, often related to the determinants of learning and interactions in MOOCs. MOOC researchers could benefit from exploring the difficulties experienced by participants when learning specific content. By investigating these difficulties, instructional designers could enhance

the design of MOOCs. More specifically, the didactic approach,[2] which has received little attention in the available studies, may help define the learning process and the factors that influence it. Indeed, a MOOC involves content characterized by both a didactic intention (main function) and specific components (actors, resources, content, technology, time, space, and so on; Zaid, 2017). We think that focusing on content, specifically according to a curricular didactic approach (Lebeaume, 2000; Martinand, 2012; Zaid, 2017) which examines content choices, how they are organized, and their consistency and relevance in relation to education and training missions and orientations may be a promising direction for future research. Several possible questions emerge, related to this research orientation. How does a MOOC specify or transform the content it conveys? What are the implications of an open and widely accessible course in terms of the principles of the development, transmission, and appropriation of this content? And finally, how do these principles enable learners to construct basic knowledge essential to the course?

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Appendix

1. **Alario-Hoyos et al. (2017)**: Self-regulated learning strategies in MOOCs (Cohen & Magen-Nagar, 2016; Hood et al., 2015; Zimmerman 2002);

2. **Almatrafi et al. (2018)**: Model to identify "urgent" posts that need immediate attention from instructors;

3. **de Lima and Zorrilla (2017)**: Social networks theory (Freeman, 1977);

4. **Evans and Myrick (2015)**: The diffusion of innovations approach (Rogers, 1995);

5. **Henderikx et al. (2017)**: Reasoned action approach (Fishbein & Ajzen, 2010);

6. **Hew (2016)**: Model of student engagement organized around the self-determination theory of motivation (Appleton, Christenson, & Furlong, 2008; Fredricks, Blumenfeld, & Paris, 2004);

7. **Hone and El Said (2016)**: Framework exploring the factors that affect MOOC completion/learner retention (Marks et al., 2005): course instructor effects, co-learner effects, design features;

8. **Huisman et al. (2016)**: Peer assessment of essay assignments in MOOCs (Admiraal, Huisman, & Van de Ven, 2014);

9. **Kwak (2017)**: Writing as a skill, creative, writing, writing as a process, writing as a social practice, writing in a socio-cultural context;

10. **Shapiro et al. (2017)**: Student motivations (Hartnett, St. George, & Dron, 2011), and barriers/challenges (Song & Hill, 2007);

11. **Watson, Kim, and Watson. (2016)**: Dissonance theory (Kamradt & Kamradt, 1999; Simonson, 1979; Simonson & Maushak, 1996);

12. **Watson, Watson, Richardson et al. (2016)**: Community of Inquiry (Garrison, Anderson, C& Archer, 2000) and dissonance theory (Kamradt & Kamradt, 1999; Simonson, 1979; Simonson & Maushak, 1996);

13. **Watson, Watson, Janakiraman, et al. (2017);**

14. **Watson, Watson, Yu et al. (2017)**: Dissonance theory (Kamradt & Kamradt, 1999; Simonson, 1979; Simonson & Maushak 1996), CoI framework (Garrison, Anderson, & Archer, 2000);

15. **Watted and Barak (2018)**: **M**otivational factors that influence participants' engagement in MOOCs (Barak et al., 2016; Halasek et al., 2014; Yang, 2014);

16. **Wise et al. (2017)**: Forum posts (Stump et al., 2013);

17. **Yang and Su (2017)**: Theoretical model for studying learners' continuance intentions toward participation in MOOCs**;**
18. **Zhang (2016)**: Regulatory focus theory (Higgins, 1997, 1998);
19. **Zhang et al. (2016)**: Social network analysis (SNA) (Xu, Zhang, Li, & Yang, 2015);
20. **Zhou (2016)**: Theory of self-determination (Ryan & Deci, 2002), theory of planned behaviour (Ajzen & Madden, 1986).

[1] A MOOC is a set of learning activities and resources on the web that is freely accessible to the greatest number of participants, usually at no charge and without prerequisites (Bogdan, 2017).

[2] The didactic approach consists of studying the teaching and learning processes from the point of view of the content—and its disciplinary structure—as conveyed by the MOOC.

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Book Review: Best Practices for Flipping the College Classroom

Editors: Julee B. Waldrop and Melody A. Bowdon (New York: Routledge, 2016, 166 pages)

Reviewed by: Liwen Chen[1], Tung-Liang Chen[2*], Chen Fang[3], and Li Zhou[4], *[1,2,3,4]Chung-Hua University, Taiwan, [3,4]Huaiyin Institute of Technology, China*

Despite the fact that flipped classrooms have attracted much attention over the past few years, it is still difficult to find abundant qualitative and quantitative evidence to illustrate how the flipped approach can be used for college-level teaching outcomes. Fourteen authors contributed to *Best Practices for Flipping the College Classroom*, which is the story of the remarkable adoption and growth of flipped classrooms in the U.S. Higher Education Institutions (HEIs). This book was one of a series of *Best Practice in Online Teaching and Learning*, edited by Julee B. Waldrop, a Clinical Professor in the School of Nursing at the University of North Carolina at Chapel Hill, and Melody A. Bowdon, an Executive Director of the Karen L. Smith Faculty Center for Teaching and Learning and Professor of Writing and Rhetoric at the University of Central Florida.

The book contains 166 pages of detailed examples in the use of the flipped teaching method, not only for the sciences but also for the fields of social science, math, and health. The various contributors share their unique views to help readers comprehend the experience of flipped teaching from the perspective of both faculty and students at different levels of undergraduate and graduate studies. The last chapter (Chapter 11), entitled *Conclusion: Reflecting on the Flipping Experience*, in which Melody A. Bowdon, Lissa Pompos Mansfield, and Julee B. Waldrop emphasise the integration of the concepts introduced in Chapters 2-10 is particularly interesting, since it contains the authors' reflections, exposing their various viewpoints.

Chapter 1, which is written by Erin Saitta, Brett Morrison, Julee B. Waldrop, and Melody A. Bowdon, gives an overall introduction and is tightly structured around the main theme of major theories related to flipped classrooms. In Chapter 2, Cherie Yestrebsky evaluates the learners' achievement in two large *Chemistry Fundamentals II* classes at the University of Central Florida—traditional (n=320) vs. the flipped method of teaching (n=415). Most readers will find this chapter useful, since the research results indicate that the flipped approach did not appear to benefit students with low final grades (i.e., those awarded a D or F grade); however, high achievers (i.e., those who were awarded an A or B grade) achieved better learning outcomes through flipped teaching in this difficult course. In Chapter 3, Robert Talbert provides a detailed example of how he uses course materials and guide practice to help students to take greater responsibility for their calculus at Grand Valley State University.

In Chapter 4, Julee B. Waldrop uses surveys and focus groups to investigate students' responses to a flip graduate-level nursing course at the University of Central Florida, while Daniel Murphree discusses

a flipped history class at the University of Central Florida in Chapter 5. Clarissa Thompson and April Martin compare students' learning outcomes and perceptions of two large introductory psychology courses at the University of Oklahoma (traditional face-to face vs. flipped method) in Chapter 6, and subsequently, Michael S. Garver describes how he integrated individual and team clicker competitions in his Central Michigan University flipped marketing classes in order to enhance students' engagement in Chapter 7.

A course in economics is the setting for Chapter 8, in which the Metropolitan State University of Denver's Katherine M. Sauer arms her readers with a range of teaching strategies. Most students liked the videos, but they still disliked note-taking and text-reading by the end of the semester. In Chapter 9, Russell Carpenter discusses a number of issues related to how he deployed a flipped approach into his course entitled *Introduction to Applied Creative Thinking* at Eastern Kentucky University. He suggests that flipping the classroom increases student engagement and provides a learning context that is challenging and productive. Finally, in Chapter 10, Stacey Pigg and Brett Morrison pay particular attention to a unique case study of students' perception of the flipped classroom across History and Spanish courses.

Chapters 2-9 begin with a concise table containing a description of each flipped course, and this is followed by a brief explanation of the course format, enrolment, and institutional context. All the chapters cover and conclude with further suggestions for implementation. Although these elements are fundamental, most readers will find them useful as a reference for the design of their curriculum and research. The researchers in this book utilise surveys, test scores, online discussions, interviews, blog reflections, and observations to collect their data. Various research designs, including experimental research, case study, and action study, were used in these flipped classroom studies. The authors suggest that this practice produces a number of positive impacts in terms of learners' motivation, engagement, interaction, and achievement. It is interesting to note that some of the studies suggest that educators may consider flipping a small portion of the course first (viz., don't try to flip an entire class at once) in order to make an impact on students' learning. Overall, most readers will find these chapters useful, since they contain a well-balanced view by addressing the benefits and potential improvements of flipped classrooms, as well as the challenges and concerns. While the detail in the book is much appreciated, it is believed that the chapters could be enhanced by the provision of more discussions on how to use technology to encourage more collaboration between students outside the classroom.

This book is also well-grounded in both *theory* and *practice* since several educational technology resources and learning portals are described in detail. This publication is intended to be highly practical for both novice and experienced faculty to help them to improve their flipped teaching strategies through the use of simple, familiar, and accessible instructional technologies. As a consequence, educators who are searching for a new pedagogical approach in various academic disciplines will appreciate the blend of new-fangled pedagogical theories and evidences in the book.

If this book could be subject to any criticism, it would be that, although it contains a systematic assessment of the flipped classroom approach, its emphasis is limited to local preliminary findings in the United States. It is unfortunate that more attention was not given to international practices, providing a mixture of how and why flipped classrooms were developed in the West and the East. Since we live in an interconnected world, this would have helped readers to better understand current

educational endeavours and the potential of flipped teaching to meet the local, regional, and global needs; for example, how a flipped classroom provides an "alternative option" for those with diversified cultural backgrounds who desire to participate as learners, educators, and practitioners. The United States has been a major destination for international students, with approximately one million enrolled in HEIs across the country in the 2015-2016 school year. This represented 5.2% of all students enrolled in HEIs nationwide, and remarkably, with about 12% of international students were enrolled in places such as the District of Columbia and the state of Massachusetts (Redden, 2016). Thus, it was felt that the internationalisation of higher education and the flipped classroom could have received greater coverage. Apart from these minor constraints, *Best Practices for Flipping the College Classroom* is a noteworthy contribution to the field and is likely to inspire early adopters in terms of further exploration and implementation.

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Book Review: Transactional Distance and Adaptive Learning: Planning for the Future of Higher Education

Authors: Farhad Saba and Rick L. Shearer (New York: Routledge, 2018, 211 pages)

Reviewed by: Abdullah Saykili, *Anadolu University*

Established by Michael G. Moore about fifty years ago, The Theory of Transactional Distance (TTD) offers a view of teaching and learning which posits that distance in educational processes is not only a geographical, but also a psychological one. The idea that three distinct but interplaying variables—dialogue, structure and autonomy—shape the landscape of any educational setting, has provided guiding principles for open and distance learning (ODL).

By developing a renewed perspective on TTD through the lens of systems dynamics, the book *Transactional Distance and Adaptive Learning* situates one of the most influential theories in ODL into the center of its focus relating the theory to the changing landscape of higher education. To deal with the challenges triggered primarily by societal changes and the impact of emerging technologies, the authors offer the stakeholders concerned with education, from instructors to policy-makers, a comprehensive and adaptive model based on TTD to assess their current educational practices and develop alternative solutions in order to prepare for the future.

The book begins with a foreword by Michael G. Moore who, through the fable of chickens and owls, encourages the faculty to leave their "academic perch" (Saba & Shearer, 2018, p. xvi) and share their knowledge and expertise to guide and help the educational institutions better serve for the needs of the society in a time of complexity, uncertainty, and constant change. Both Moore and the authors emphasize the need for a reform of the educational paradigm based on the industrial era. According to the authors, the barriers and the opportunities presented by the current technologies cannot be fully understood while the universities "have one foot in the modern industrial era and another in the emerging postmodern epoch" (Saba & Shearer, 2018, p. xxiii). Therefore, the efficient and effective utility of current and future technologies depends heavily on transitioning from the industrial school model that focuses on standardized education of masses to the postmodern school model that highlights the needs, characteristics, and demands of the individual, adapting continually and accordingly.

The authors adopt a systems approach in addressing the issues surrounding the educational endeavors of higher education institutions, which is akin to Moore and Kearsley's (2012) systems view of distance education. They present their systematic model in three fundamental universes of systems. The first universe of systems, at the micro level, includes those that allow interaction and communication between learners, faculty, and administrators including hardware, software, and telecommunications systems. The authors also place a special emphasis on Adaptive Learning Systems (ALS) within the software systems since ALS have the potential to optimize the transactional distance in an educational

setting. ALS, with their abilities to shape the learning environment to better suit the learner needs and characteristics (Ennouamani & Mahani, 2017), offer a personalized form of education that is actively and dynamically tailored for each learner's learning-related traits, cognitive and experiential standing, as well as his/her learning context (Spector, 2012). Within this regard, ALS impact the transactional distance that a learner experiences through decreasing the structure of the educational experience and increasing the possibilities for more dialogue and autonomy. The chapter dedicated to ALS sufficiently informs the reader on the current use and effectiveness of ALS in addition to the related concepts and applications, including Adaptive Hypermedia Systems, Adaptive Simulations, and Serious Games. While the title of the book creates an expectation that the reader would find more on the potential link between ALS and the constructs that make up TTD, the authors only touch on this relationship lightly. It would be worthwhile to expand on how ASL can help address dialogue, structure, and autonomy as constructs shaping an individual's educational experience.

At the meso level, the second universe of systems that requires consideration for effective adoption of the principles of TTD are the instructional and curricular systems that accommodate the teaching and learning environments. The authors address instructional design models within a transactional distance vantage point, viewing instructional design models as a continuum rather than "mutually exclusive concepts" (Saba & Shearer, 2018, p. 114). At the macro level, the third universe of systems that interact extensively with the successful implementation of TTD principles are the management, societal, and global systems that determine and shape the ways in which institutions are supported, funded, and managed. Each system in the model interact and impacts, on a larger or smaller scale, the other systems, and it is the overall interaction of these distinct, but interlocked systems, that determines the efficiency of the transition of a higher educational institution from an industrial school to a postindustrial and postmodern one that can better adapt itself to the changing climate.

The authors present cases at the end of each chapter, which serve not only to exemplify how each system affects the educational practices, but also to clarify the ways in which institutions can handle the challenges imposed by a malfunctioning system. The book also includes a "From Theory to Practice" section that seeks to help stakeholders formulate a unique future for their respective institutions based on the TTD principles through system dynamics modelling methodology (Saba & Shearer, 2018, p. 182). Within this regard, the book serves both theoretical and practical purposes. The authors also offer a review of selected literature on TTD with a special focus on system dynamics research as an appendix.

In sum, this book addresses the TTD from systems dynamics perspective underscoring that the true value of the emerging technologies can only be realized in educational settings when an educational reform is undertaken through a holistic approach that takes the eight hierarchical systems discussed in this book into consideration. Within this regard, TTD offers a renewed lens toward understanding the complexity of higher education today. TTD, when combined with the system dynamics approach optimizing transactional distance for each learner, has the potential to help visualize and realize a future for higher education which is better equipped to the navigate uncertain waters.

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Examining Online Health Sciences Graduate Programs in Canada

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Abstract

Approximately one in 10 employed Canadians worked in health care and social services in 2016. Health professionals perceive life-long learning as an important element of professional life and value flexibility in their continuing education activities. Online learning is ideally suited to meet this need for flexible health sciences continuing education. The present study sought to identify and characterize online graduate programs in health sciences offered by Canadian universities. All Canadian (non-technical) university websites were hand searched for online graduate programs in health and related fields. Each identified program was characterized by 10 features: province, university, flexibility (i.e., fully online or blended), subject area, curriculum (e.g., coursework, thesis or project, practicum), duration and timing options (i.e., full-time, part-time), admission requirements, class size and acceptance rates, and employment outcomes. The search identified 171 Canadian university online graduate programs in health and related fields. Across Canada, the greatest numbers of programs are offered in Ontario and British Columbia. Most programs are master's and graduate certificate programs, with graduate diploma and PhD programs being less common. While the majority of programs require an undergraduate degree for admission, some programs base entry requirements on previous work experience. Most programs offer a blended learning experience, with fewer being fully online. The most common content areas include nursing, public health, occupational health, and occupational therapy. These findings highlight opportunities to advance fully online, health continuing education in novel subject areas.

Keywords: online, health professional, post-secondary education, continuing education, e-learning, Canada

Introduction

E-learning, as defined by the Canadian Council on Learning, involves the development of knowledge and skills through the use of technology (Canadian Council on Learning [CCL], 2009). Technology can support engagement with content through online learning activities and tools, and promote interaction among individuals in distance education (Abrami et al., 2006). Many higher education institutions are adopting e-learning as a means of providing accessible and flexible educational opportunities to meet the learning needs of students in the 21st century. Indeed, e-learning has become a critical cornerstone in higher education advancement. The number of Canadian adults between the ages of 25 to 64 holding university degrees continues to rise (Statistics Canada, 2013) and post-secondary institutions have reported steady growth in online enrolments since 2015 (Martel, 2015; Bates et al., 2017; Donovan et al., 2018). In 2016-2017, 17% of all Canadian post-secondary students were taking at least one online course for credit, and 65% of those same post-secondary institutions anticipated modest (1-10%) to fast growth (over 10%) of their online enrolments over the next year (Donovan et al., 2018). Catering to the growing student demographic of part-time, mature, and working professionals, online education offers convenient, flexible, student-centered educational opportunities (Innes, Mackay, & McCabe, 2006). For 57% of Canadian institutions, online learning was rated very important for expanding continuing and professional education programs (Donovan et al., 2018). Moreover, online education allows for universities to increase student access, be more economically competitive by attracting students from outside the traditional service area, improve educational attainment, and provide pedagogical improvements (Abrami et al., 2006; Donovan et al., 2018).

Data from multiple domains provide strong evidence that health education is an area of current and future demand, not only in Canada, but worldwide. As the Canadian population ages, there has been a rise in life expectancy accompanied by chronic conditions such as arthritis, diabetes, and cardiovascular disease (Public Health Agency of Canada, 2016). This demographic change is increasing the demand on healthcare systems, highlighting the need to expand the number of health professionals who possess the competencies and skills required to: 1) adapt to the rapidly evolving health care sectors, and ii) contribute to the complex problem-solving that is required by the health changes of today and tomorrow. E-learning has been found to be an appropriate and effective method for learning health-related content and can be used to meet this growing need for working health professionals (Moore & Hart, 2004; Shenk, Moore, & Davis, 2004; Wernet, Olliges, & Delicath, 2000).

Currently, few studies have investigated online learning opportunities in the health sciences in Canada. This may be attributed to the devolved and distributed structure of the higher education system (Contact North, 2016). Highlighting this gap in the literature presents a time-sensitive and valuable opportunity to further our understanding of online education opportunities in Canada. To our knowledge, no published studies have evaluated the current landscape of online graduate education in the health sciences offered by Canadian universities. Consequently, this research aimed to identify and characterize current online postgraduate programs in health and related fields offered by Canadian universities. The study identified existing program availability and opportunities for further development in novel areas of concentration.

Methods

Canadian university websites were manually searched between January 2017 and October 2017 for fully online or blended graduate programs in a health or health-related field. College-level institutions and polytechnic universities were excluded from this study in order to focus on university-based programs. All data were exclusively collected from the university websites; universities were not contacted for further information or clarification about their online programs.

Programs were included in the data analysis if they met the following inclusion criteria: (i) online format, (ii) graduate-level program (e.g., post-baccalaureate certificates, diplomas, master's and PhD), and (iii) in a health or health-related field. To meet the online inclusion criterion, the majority of the program had to be available in an online or blended format. A program was considered graduate-level if a post-secondary degree or equivalent credential was required for admission. A program was defined as a health or health-related program if the program's stated intent was to provide education related to health. Health, as defined in the Constitution of the World Health Organization, is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity (World Health Organization, 1948).

A list of all Canadian universities was created (see Appendix) and corresponding university websites were searched by three independent researchers, including two bilingual speakers. To identify online health programs that meet set inclusion criterion, a thorough search process was undertaken using the Google search engine, university website search features, and direct access to relevant departmental web pages. This preliminary search yielded 192 programs that were entered into an Excel database. To validate the accuracy of program findings, all university websites were reviewed again by an independent researcher. A cross-comparison of research findings was conducted, along with a consolidated team analysis to review any discrepancies in inclusion. A total of 171 programs met the inclusion criteria following the final phase of data collection.

The data were analyzed iteratively using content analysis. Data were categorized in the database according to: province, university, program name, program type, subject area, learning format, program format, experiential learning, program flexibility, academic admissions, work or volunteer-related admissions criteria, class size, acceptance rates, and job outcomes. Codes were inductively created from recurring patterns in the data, as well as defined and categorized to assist in thematic analysis (Table 1).

Table 1

Codebook Used to Deductively Code Data

Category	Definition	Description of codes
Program type	Coded as certificate, diploma, master's, doctorate, or other.	Other: if program did not fit into the other four categories.
Subject area	Code based on program title or program description.	Varied
Learning format	Coded as fully online or blended format.	Fully Online: no requirements to attend campus for learning, however, an experiential learning

		opportunity such as an internship may be required. Blended: requires some component of attending classes, workshops, or retreats on campus.
Program format	Coded as thesis, course, course/thesis, or thesis/project.	Thesis: requires a thesis in addition to required coursework. Course: coursework only. Course/Thesis: an optional thesis in addition to required coursework. Thesis/Project: optional thesis or project in addition to coursework.
Experiential learning	Coded as experiential learning or none.	Experiential Learning: experiential learning opportunity, either required or optional. Experiential learning included capstone or culminating project, on-campus residencies or labs, practicum or internship, or similar experience. Thesis was not included in experiential learning. None: no experiential learning opportunity.
Program flexibility	Coded as flexible or not flexible based on scheduling options.	Flexible: programs provide options in completion time, the number of courses students are required to take concurrently, the range of durations over which program can be completed, or is offered part-time. Not Flexible: full-time or a structured format with specified end date.
Academic admission requirements	Coded as undergraduate degree or equivalent, undergraduate degree plus additional qualifications or degrees, academic experience, or other.	Undergraduate Degree or Equivalent: required an undergraduate degree, certificate, diploma, or equivalent credential. Undergraduate Degree Plus Additional Qualifications, Degrees, or Academic Experience: previous code requirements, plus an additional qualification, degree or academic experience (e.g., registered nurse, or graduate degree). Other: required academic admissions other than the previous two codes.
Other admission requirements	Code based on additional admission requirements including work, volunteer experience, or not a requirement for admission.	Work Experience: work experience in addition to academic requirements. Work or Volunteer Experience: work or volunteer experience in addition to academic requirements. Not a Requirement for Admission: did not require work or volunteer experience.
Class size	Code based on availability of information on class size.	No: information on class size not provided. Yes: information on class size provided.
Acceptance rates	Code based on availability of information on acceptance rates.	No: information on acceptance rates not provided. Yes: information on acceptance rates provided.
Job outcomes	Code based on availability of information on potential employment outcomes.	No: potential career outcomes not provided. Yes: specific career outcomes provided. Vague: vague or very general careers in health care noted.

Results

The results from the website search identified 171 online graduate programs in a health or health-related field offered across 44 Canadian universities (Table 2). The programs were offered across Canada, in British Columbia (n=35), Alberta (n=26), Saskatchewan (n=9), Manitoba (n=1), Ontario (n=50), Quebec (n=26), New Brunswick (n=6), Nova Scotia (n=10), and Newfoundland (n=8). There were greater numbers of programs available in some provinces, particularly Ontario and British Columbia, likely in accordance to a higher saturation of universities in these provinces. No programs were identified within the Yukon Territory, Northwest Territories, Nunavut, and Prince Edward Island.

Table 2

Summary of Program Findings

Total programs	Program type	Common content areas	Program delivery	Program structure	Experiential learning	Admission requirements
171 programs	47 certificate 21 diploma 76 master's 4 doctoral 3 combined 20 other	Nursing Public health Occupational health or physical therapy	76 fully online 92 blended 3 blended or online	132 flexible, part-time	111 experiential education (i.e., internships, practicums, residencies)	89 undergraduate or equivalent 70 undergraduate plus additional qualifications 70 required work/volunteer experience

Of the 171 programs identified, there was a variety of graduate-level credentials, certifications, and degree opportunities in the health field. The results identified 47 certificate, 21 diploma, 76 master's, and four doctoral online health programs. Three combined degree programs, including a graduate diploma and master's degree, and dual-master's degrees, were also identified. Some programs (n=20) did not report the type of graduate credential, or did not classify the program as a certificate, diploma, master's, or doctoral degree (i.e., microprogram).

The most common content areas offered by the online programs included: nursing, public health, and occupational health or physical therapy. This finding was consistent across the certificate, diploma, master's, and doctoral program types, with some variance in subject area frequency and availability. Of the certificate programs, there was a higher prevalence of nursing (n=13), occupational health and safety (n=5), public health (n=4), and mental health (n=4) programs. The diploma programs included varied subject areas, with a higher proportion of nursing (n=4) and health information (n=3) program availability. Of the four PhD programs identified, three programs specialized in nursing. Finally, there was a higher frequency of nursing (n=21), public health (n=9), social work (n=7), counselling (n=5), occupational therapy (n=4), and clinical science (n=4) master's programs. Less common were programs in the following subject areas: addiction, anesthesia, clinical epidemiology, food science/safety, oncology, palliative care, nutrition, health

and social services, rehabilitation science, dementia, polysomnography, health leadership/management, health education, pediatric psychosocial care, gerontology, child psychology, eHealth, and medical radiation.

The programs identified were delivered fully online, or in a combination of distance and on-campus face-to-face learning experiences, which were referred to as blended. A total of 76 programs were fully online, with a higher proportion of certificate (n=37) and diploma (n=10) programs, compared to master's (n=14) and doctoral (n=0) degrees. The majority of programs included a blended learning format (n=92), with mandatory on-campus institutes, courses, residencies, workshops, practicums, and other in-class delivery methods. Three programs offered both blended and fully online learning opportunities, dependent on student preference. Many of the programs (n=132) included flexible program structures, with part-time and self-selected paces. According to program type, many of the certificate (n=37), diploma (n=17), master's (n=57), and doctoral (n=2) programs included flexible formats and duration.

In congruence with flexible format structure, a significant portion of the programs offered experiential learning opportunities (n=111). These included internships, practicums, residencies, clinical practice, research projects, placements, workshops, labs, and fieldwork. Most of the master's (n=67) and doctoral (n=4) programs offered an experiential education component; whereas, certificate (n=19) and diploma (n=10) programs were less likely to offer hands-on learning experiences. Some of the master's (n=28) and all of the doctoral (n=4) programs offered a thesis or dissertation option.

Most of the programs (n=89) required an undergraduate degree or equivalent for admission into the program. Equivalent qualifications included a college degree, undergraduate-level courses, certificate, or diploma. Some programs (n=70) required an undergraduate degree plus additional qualifications, degrees, or academic experience. For example, a post-secondary education degree or diploma, in addition to registration by an accredited government body (i.e., a Registered Nurse in Canada) or a graduate-level degree *were required for admission*. Many of the program admission requirements (n=70) included previous work or volunteer experience, which ranged in duration and relevance to the program-area. Finally, few program websites (n=14) offered information about acceptance rates and class sizes.

While some program websites provided information about employment opportunities and career outcomes, including a list of specific career options or opportunities for advancement in their field, this content tended to be ambiguous or largely undefined for the majority of programs. For example, one Master of Public Health webpage described career opportunities with the following statement: "Career in public health practice."

Discussion

The present study identified 171 online programs in health or a health-related field offered by Canadian universities. Certificate and master's programs are the most prevalent online health credentials, with fewer online educational opportunities at the diploma or doctoral level. The majority of programs focus on specific disciplines or professions including nursing, public health, and occupational health or therapy; fewer online

programs take an interprofessional perspective. Many programs offer an experiential learning component, particularly those at the master's and doctoral levels. Less than half of the programs identified were offered fully online, with the remaining programs requiring students to participate in a mandatory on-campus component, which was clearly indicated on the program websites. Thus, there appears to be an opportunity to develop additional, fully online graduate programs in health sciences, particularly at the master's and doctoral level, incorporating interprofessional learning and practice within the program pedagogy.

Limitations

While procedures were put in place to improve the overall quality of the collected data, there are some limitations to this study. The search strategy used to collect data could have missed programs at universities as the websites of non-health departments, such as education and psychology, were not searched. Some websites were difficult to navigate and information was often not optimally presented, or information was implied rather than explicitly stated. Lastly, since these data reflect only information available to the researchers within the 10-month period of time over which they were collected, and due to the evolving nature of online and program information, the present findings could quickly become outdated. Despite these limitations, the present findings contribute to our understanding of the current state of e-learning across Canadian universities in the field of health.

While most university websites provided program overviews, admission requirements, application process and deadlines, and course information, many program website layouts were difficult to navigate and some information was unable to be retrieved. A limited number of websites provided statistical information regarding acceptance rates and class sizes for prospective students. Highlighting such pertinent information with greater transparency is one avenue for change. In addition, employment opportunities associated with the program were often ambiguous and largely undefined. Program websites should be designed in a comprehensive, accessible manner to attract and inform prospective students. Along with standard program information, websites should offer data and supporting information pertaining to program admissions and employment after graduation.

Future Program Development and Research

As indicated by the number of applications Canadian universities receive for their graduate program(s) in the health sciences field, there is no shortage of student interest in pursuing a health-related career as indicated. This study suggests that online academic programs are readily available to a vast population of students. As this educational format continues to gain popularity, institutional websites must continue updating their websites to foster the needs of the student population. This includes providing relevant, up-to-date information that is presented to interested students in a logical, user-friendly format, allowing for efficient navigation. Today, university students and employed professionals alike, place a high value on flexibility of time and place in their continued educational endeavors. Therefore, the need to provide additional fully online programs that contain experiential learning opportunities is of great importance and

deserves an in-depth investigation of how this structure of learning can be further integrated into additional university programs throughout Canada.

Future work in this area may deepen our understanding of e-learning in Canada by extending the search beyond universities to include colleges and polytechnic universities, and extending the search beyond health science to better understand the availability of e-learning generally. Search strategies could be improved by surveying universities about the number of programs that offer e-learning. Comparing this search to similar searches in other countries with online health science programs would develop our understanding of how Canada fits into the global context of e-learning.

Conclusions

This research aimed to identify current online graduate programs in the health sciences offered by Canadian universities. As this research suggests, there is a critical and continual need for online graduate programs to be structured in a format that allows for an optimal level of accessibility and flexibility for the student population. While this type of education is increasing among Canadian institutions, findings suggest that this program configuration is particularly lacking at the master's and doctoral level. Additional fully online post graduate programs that align with personal demands of potential students such as ongoing work and family commitments are needed.

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Appendix

List of University Websites Searched

Province	University	Website link	Reasons for inclusion/exclusion
Alberta	Ambrose University	https://ambrose.edu/	No graduate health courses
Alberta	Athabasca University	http://fhd.athabascau.ca/	Yes
Alberta	Burman University	https://www.burmanu.ca/	No graduate health courses
Alberta	Concordia University of Edmonton	https://concordia.ab.ca/	Yes
Alberta	King's University	https://www.kingsu.ca	No graduate health courses
Alberta	Grant MacEwan University	https://www.macewan.ca/	Yes
Alberta	Mount Royal University	http://www.mtroyal.ca/	Yes
Alberta	St Mary's University	https://www.stmu.ca/	No graduate health courses
Alberta	University of Alberta	https://www.ualberta.ca/	Yes
Alberta	University of Calgary	http://werklund.ucalgary	Yes
Alberta	University of Lethbridge	https://www.uleth.ca/	Yes
British Columbia	Capilano University	https://www.capilanou.ca/	No graduate health courses
British Columbia	Emily Carr University of Art and Design	http://www.ecuad.ca/	No graduate health courses
British Columbia	Simon Fraser University	https://www.sfu.ca/	Yes
British Columbia	Thompson Rivers University	https://www.tru.ca/	Yes
British Columbia	Trinity Western University	https://www.twu.ca/	Yes
British Columbia	University of the Fraser Valley	https://www.ufv.ca/	Yes
British Columbia	University of British Columbia	http://www.mrsc.ubc.ca/	Yes
British Columbia	University of Northern British Columbia	https://www.unbc.ca/	No
British Columbia	Royal Roads University	http://www.royalroads.ca/	No graduate health programs
British Columbia	University of Victoria	https://www.uvic.ca/	Yes
British Columbia	Vancouver Island University	https://programs.viu.ca/	Yes
British Columbia	University Canada West	https://ucanwest.ca/	No graduate health programs
British Columbia	University of British Columbia Okanagan	http://ok.ubc.ca/welcome.html	Yes
British Columbia	Quest University	https://questu.ca/	No graduate health programs
British Columbia	Fairleigh Dickson University	http://www.fdu.edu/	No online graduate courses offered from Vancouver campus or online
Manitoba	Brandon University	https://www.brandonu.ca/	Yes
Manitoba	University of Manitoba	http://umanitoba.ca/	No online graduate health programs
Manitoba	University of Winnipeg	https://www.uwinnipeg.ca/	No graduate health programs
Manitoba	University College of the North	https://www.ucn.ca/default ed.aspx	No graduate health programs
Manitoba	Canadian Mennonite University	http://www.cmu.ca/	No graduate health programs
Manitoba	Providence University College	http://www.prov.ca/	No graduate health programs
Manitoba	Booth University College	https://www.boothuc.ca/	No graduate health programs

Manitoba	Université de Saint-Boniface	https://ustboniface.ca/	No graduate health programs
New Brunswick	Université de Moncton	https://www.umoncton.ca/	No online graduate health programs
New Brunswick	Mount Allison University	https://www.mta.ca/Prospective/Default.aspx	No graduate health programs
New Brunswick	St Thomas University	http://w3.stu.ca/stu/	No graduate health programs
New Brunswick	University of New Brunswick	http://www.unb.ca/	Yes
New Brunswick	Crandall University	http://www.crandallu.ca/	No graduate health programs
New Brunswick	St Stephen's University	http://ssu.ca/	No graduate health programs
New Brunswick	University of Fredericton	https://www.ufred.ca/	No undergraduate admissions requirements
New Brunswick	Kingswood University	https://www.kingswood.edu/	No graduate health programs
New Brunswick	Yorkville University	http://www.yorkvilleu.ca/	Yes
Newfoundland & Labrador	Memorial University of Newfoundland	https://www.mun.ca/	Yes
Nova Scotia	Dalhousie University	https://www.dal.ca/	Yes
Nova Scotia	Saint Mary's University	https://www.smu.ca/	Yes
Nova Scotia	Acadia University	https://www2.acadiau.ca/index.php	No graduate health programs
Nova Scotia	Mount Saint Vincent University	http://www.msvu.ca/	Yes
Nova Scotia	University of King's College	https://ukings.ca/	No graduate health programs
Nova Scotia	St Francis Xavier University	https://www.stfx.ca/	Yes
Nova Scotia	Cape Breton University	https://www.cbu.ca/	No graduate health programs
Nova Scotia	Université Sainte-Anne	https://www.usainteanne.ca/	No graduate health programs
Ontario	Algoma University	https://www.algomau.ca/	No graduate health programs
Ontario	Brock University	https://brocku.ca/	Yes
Ontario	Carleton University	https://carleton.ca/	No online graduate health programs
Ontario	Lakehead University	https://www.lakeheadu.ca/	Yes
Ontario	Laurentian University	https://laurentian.ca/	Yes
Ontario	McMaster University	https://www.mcmastercce.ca	Yes
Ontario	Nipissing University	http://www.nipissingu.ca/	No graduate health programs
Ontario	Queen's University	http://www.queensu.ca/	Yes
Ontario	Saint Paul University	https://ustpaul.ca/	No graduate health programs
Ontario	Redeemer University College	https://www.redeemer.ca/	No graduate health programs
Ontario	University of Sudbury	https://www.usudbury.ca/	No graduate health programs
Ontario	Ryerson University	http://www.ryerson.ca/	Yes
Ontario	OCAD University	https://www.ocadu.ca/	No online graduate health programs
Ontario	University of Guelph	https://www.uoguelph.ca/	Yes
Ontario	University of Toronto	http://www.utoronto.ca/	Yes
Ontario	University of Ottawa	https://www.uottawa.ca/en	Yes
Ontario	University of Waterloo	https://uwaterloo.ca/	Yes
Ontario	University of Windsor	http://www.uwindsor.ca	Yes
Ontario	Western University	https://www.uwo.ca	Yes
Ontario	Wilfrid Laurier University	https://www.wlu.ca/	No online graduate health programs.
Ontario	Trent University	https://www.trentu.ca/	No online graduate health programs.
Ontario	York University	http://www.yorku.ca/	Yes
Prince Edward Island	University of Prince Edward Island	http://www.upei.ca/	No online graduate health programs

Quebec	Laval University	https://www.ulaval.ca/en.html	Yes
Quebec	McGill University	https://www.mcgill.ca	Yes
Quebec	Bishop's University	http://www.ubishops.ca/	No graduate health program
Quebec	TELUQ	https://www.teluq.ca/	Yes
Quebec	Concordia University	https://www.concordia.ca/	No graduate health program
Quebec	Université du Quebec à Montréal	https://uqam.ca/	No online graduate health program
Quebec	Université du Quebec à Chicoutimi	http://www.uqac.ca/	No graduate health programs
Quebec	Université de Montréal	http://www.umontreal.ca/	Cannot identify relevant programs
Quebec	Université de Sherbrooke	https://www.usherbrooke.ca	Yes
Quebec	Université du Québec à Trois-Riviéres	https://www.uqtr.ca/	Yes
Quebec	Université du Quebec à Outaouais	https://uqo.ca/	Cannot identify relevant programs
Quebec	Université du Quebec à Rimouski	https://www.uqar.ca/	No online graduate health programs
Quebec	Université du Quebec en Abitibi- Témiscamingue	http://www.uqat.ca	Yes
Saskatchewan	University of Regina	https://www.uregina.ca	Yes
Saskatchewan	University of Saskatchewan	https://nursing.usask.ca	Yes
Saskatchewan	First Nations University of Canada	http://fnuniv.ca/	No graduate health programs

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Online Course Design: A Review of the Canvas Course Evaluation Checklist

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Abstract

The evaluation of online courses is an important step in providing quality online courses. There are a variety of national and statewide evaluation tools used to help guide instructors and course designers of online courses (e.g., Quality Matters, OSCQR). This paper discusses a newly released course evaluation instrument from Canvas, the second largest learning management system (LMS) used by higher education institutions in the United States. The characteristics and unique features of the Canvas Course Evaluation Checklist (CCEC) are discussed. The CCEC is also compared to established national and statewide evaluation instruments. This review is helpful for those interested in online course design and developments in the field of online education.

Keywords: Canvas, course design, distance education, evaluation instruments, online education, quality, Quality Matters

Introduction

Online education has become a mainstream component of higher education. Annually, nearly one-third of students enroll in online courses (Seaman, Allen, & Seaman, 2018), with online course offerings representing the fastest growing sector in higher education (Lederman, 2018). A recent *Inside Higher Ed Survey of Faculty Attitudes on Technology* (2018; N=2,129) found that 44% of faculty have taught an online course and 38% have taught a blended or hybrid course (Jaschik & Lederman, 2018).

To teach a distance education or blended course, faculty members generally rely on some form of learning management system (LMS; Ismail, Mahmood, & Abdelmaboud, 2018). The LMS has a large impact on the way online education is presented and perceived. The LMS influences "pedagogy by presenting default formats designed to guide the instructor toward creating a course in a certain way" (Lane, 2009, para. 2). In the United States, the current LMS market is dominated by Blackboard, Canvas, Moodle, and Desire2Learn (also known as Brightspace, D2L), which account for 90.3% of institutions, and 92.7% of student enrollment (Edutechnica, 2019). Blackboard, released in 1997, has a 30.9% share of institutions and 33% of student enrollment. Canvas, released in 2011, supplies 30.6% of institutions and 35.47% of student enrollments. In comparison, Moodle has a 17.7% share of institutions and 12.41% share of student enrollment—an indication that smaller schools typically utilize Moodle (Edutechnica, 2019).

Canvas is the fastest growing learning management system in the United States (see Figure 1; Edutechnica, 2019). Nearly 80% of new LMS contracts in U.S. and Canadian higher education result in a move to Canvas (Hill, 2016). According to *U.S. News and World Report's* (2018) annual ranking of top 25 online bachelor degree programs, Canvas LMS is used by four of the top five institutions and "14 of the top 25 online bachelor's degree programs" (Instructure, 2018a). Recently, Canvas published a course evaluation checklist to guide the users of the LMS in designing quality online courses. This checklist has the potential to impact online course design by Canvas LMS users at 1,050 institutions, with enrollments totaling 6,647,255 students as of Spring 2019 (Edutechnica, 2019).

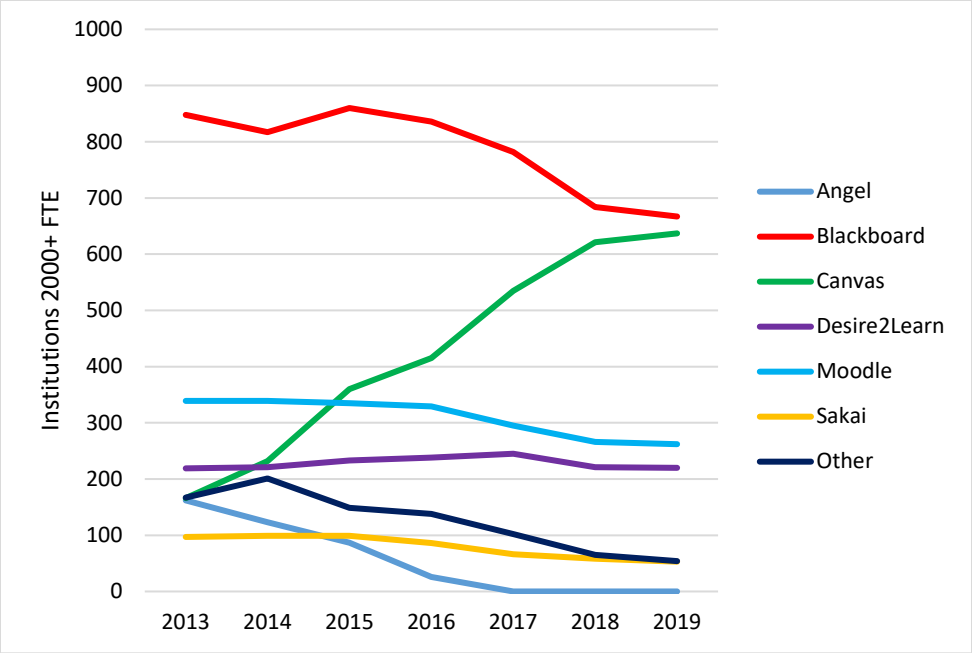

Figure 1. LMS market share in U.S. Higher Education Fall 2013-2019 by institution (2000+FTE; Edutechnica, 2019).

Educators have a vested interest in offering quality courses. Nine out of 10 faculty members (N=2,129) surveyed by *Inside Higher Ed* and Gallup (Jaschik & Lederman, 2018) said they were involved in online or hybrid course design. And, only 25% of these faculty members reported using an instructional designer to help design or revise online courses (Jaschik & Lederman, 2018). Evaluation instruments for online course design can be an important tool to provide support and guidance. Providing easy to use evaluation tools and determining the elements that should be assessed can help guide instructors who design online and blended learning, and highlight best practices.

A review of six publicly available national and statewide online course evaluation instruments for the design of higher education online courses in the United States was recently published (see Baldwin, Ching, & Hsu, 2018). This review identified 12 universal criteria found in all six national and statewide evaluation instruments, nine criteria found in five out of six evaluation instruments, and one criterion found in four out of six evaluation instruments. Since then, the Canvas Course Evaluation Checklist (CCEC), a new national course evaluation instrument has been released (Instructure, 2018b). This evaluation tool is similar to the Blackboard Exemplary Course Program Rubric in that it has been published by a learning management system company. Due to the potentially large impact of this new evaluation tool, this paper aims to explore:

- What are the characteristics of the CCEC?
- How does the CCEC compare to other national and statewide evaluation instruments?
- What are the unique features of the CCEC?

Method

Data Analysis

Both authors independently compared the CCEC to the previously reviewed national and statewide evaluation instruments (Baldwin et al., 2018):

- Blackboard Exemplary Course Program Rubric (Blackboard; Blackboard, 2017).
- CVC-OEI Course Design Rubric (OEI; California Virtual Campus-Online Education Initiative, 2018).
- Open SUNY Course Quality Review Rubric (OSCQR; State University of New York, 2018).
- Quality Learning and Teaching (QLT; California State University, 2019).
- Quality Matters Higher Education Rubric (QM; Quality Matters, 2018).
- Quality Online Course Initiative (QOCI; Illinois Online Network, 2018).

Initially we assessed the CCEC's characteristics to those on the national and statewide evaluation instruments above (e.g., intended usage, audience, ease of adoption, rating scale, cost/availability, training requirements for users; Table 1).

Table 1

Characteristics of Evaluation Instruments

Organization	**Blackboard**	**CCEC**	**OEI**	**OSCQR**	**QLT**	**QM**	**QOCI**
Intended usage	National	National	California	National	California	National	Illinois
Started	2000	2018	2014	2014	2011	2003	1998
Current version	2017	2018	2018	2018	2017	2018	2018
Audience	Instructors and course designers.	Canvas LMS users.	Instructors and staff.	Instructors and instructional designers.	Faculty, faculty developers, and instructional designers.	Instructors and instructional designers.	Instructors and staff.
New or mature	Mature courses.	New and mature courses.	New courses.	New and mature courses.	Mature courses.	Mature courses.	New and mature courses.
Purpose	Identify and disseminate best practices for designing high quality courses.	To elevate the quality of Canvas courses.	Establish standards to promote student success and conforms to existing regulations.	Continuous improvement of quality and accessibility in online courses.	To help design and evaluate quality online teaching and learning.	Look at course design to provide peer-to-peer feedback towards continuous improvement of online courses. Also "certifies course as meeting shared standards of best practice."	Improve accountability of online courses.
Rating scale	Incomplete, promising,	None, but design components	Incomplete, exchange ready, additional	Minor revision, sufficiently	Does not meet/rarely or	Essential, very important, important.	Nonexistent, developing, meets, exceeds, N/A.

	accomplished, exemplary.	are ranked as: Expected, best practice, exemplary.	exemplary elements.	present, not applicable.	never, partially meets/ sometimes, meets/often, exceeds/ always, objective does not apply to the course.		
Cost	Free	Free	Free	Free	Free	Subscription Fee	Free
Availability	Creative Commons	Creative Commons	Creative Commons	Creative Commons	Creative Commons	Subscription	Creative Commons
Official review	Yes.	No.	Yes, by OEI trained peers.	No.	Yes, by a team of 3 certified peer reviewers (including a content expert related to the course discipline).	Yes, by team of 3 certified peer reviewers, 1 master reviewer. One reviewer must be external to institution, and one reviewer must be content expert.	No.
Training	For official review, a peer group of Blackboard clients review.	None.	Must be California Community College faculty, have online teaching experience and formal training in how to teach online and have attended a three-week training program.	None.	Recent experience teaching or designing online courses, complete a QLT reviewer course and an online teaching course, and experience on “informal” campus review team and applying QLT to courses.	Recent experience teaching online courses, Complete peer review course, and QM rubric course. Peer review course is 15 days, 10-11 hours per week.	None.
Success	Scores are weighted, with exemplary courses earning 5-6.	N/A	Course must display all exchange-ready elements to pass.	N/A	Course must meet all 24 core QLT objectives & earn at least 85% overall.	Course must rate "yes" on all 14 of the "essential" standards & earn 85% overall.	N/A
Outcome	Earn certificate of achievement and an engraved glass award, if course is rated exemplary by two of the three reviewers.	N/A	Successful courses will be placed on state-wide learning exchange registry.	N/A	Certification and course are recognized on campus and statewide websites.	Earn QM recognition.	N/A
Time to review course	Six months for official Exemplary Course program.	N/A	5-10 hours.	6-10 hours.	10-12 hours over 4-6 weeks.	4-6 weeks.	N/A

We also compared the CCEC’s physical characteristics to the previously reviewed instruments and identified the breakdown of each instrument, including the number of sections, the section names, and sub-sections (Table 2).

Table 2

Comparison of Evaluation Instruments' Physical Characteristics

Organization	**Blackboard**	**CCEC**	**OEI**	**OSCQR**	**QLT**	**QM**	**QOCI**
Number of components	4 categories, 17 sub-categories, 63 elements.	4 sections, 33 criteria.	4 sections, 44 elements.	6 sections, 50 standards.	10 sections, 57 objectives.	8 general standards, 42 specific review standards.	6 categories, 24 topics, 82 criteria.
Number of pages	10	4	19	3	10	1	25
Sections	Course Design	Course Informatio	Content Presentation	Course Overview and Information	Course Overview and Introduction	Course Overview and Introduction	Instructional Design
	Interaction & Collaboration	Course Content	Interaction	Course Technology and Tools	Assessment and Evaluation of Student Learning	Learning Objectives (Competencies)	Communication, Interaction, and Collaboration
	Assessment	Assessment of Student Learning	Assessment	Design and Layout	Instructional Materials and Resources Utilized	Assessment and Measurement	Student Evaluation and Assessment
	Learner Support	Course Accessibility	Accessibility	Content and Activities	Student Interaction and Community	Instructional Materials	Learner Support and Resources
				Interaction	Facilitation and Instruction (Course Delivery)	Learner Activities and Learner Interaction	Web Design
				Assessment and Feedback	Technology for Teaching and Learning	Course Technology	Course Evaluation (Layout/Design)
					Learner Support and Resources	Learner Support	
					Accessibility and Universal Design	Accessibility and Usability	

					Course Summary and Wrap-up		
					Mobile Platform Readiness (optional)		

Then, we coded the CCEC against the 22 common criteria found in previously reviewed evaluation instruments by comparing phrases used in the instruments. Next, we compared our analysis, to reach a consensus of the characteristics and unique features of the CCEC. We used our experience in online instruction, instructional design, and online course evaluation instrument research to guide us.

Findings

Characteristics of the Canvas Course Evaluation Checklist

The CCEC focuses on course design within the parameters of the Canvas LMS. The checklist was developed by a team of Instructure employees (Instructure is the developer and publisher of Canvas) and released in 2018. The CCEC is intended for all Canvas users, which conceivably could include instructors and instructional designers. The checklist's stated purpose is to share universal design for learning (UDL) principles, the checklist creators' expertise in Canvas, and their "deep understanding of pedagogical best practices" in an effort to "elevate the quality to Canvas courses" (Instructure, 2018b, para. 2). The instrument is available for download from Canvas on the Internet (https://goo.gl/UQbhwR); an editable version of the checklist is also available via Google Docs (https://docs.google.com/document/d/18ovgJtFCiI7vrMEQci-67xXbKHfusAHSrNYGVHXTrN4/copy). The CCEC is offered under a Creative Commons Attribution-Non Commercial-Share Alike 4.0 International License (CC-BY-NC-SA 4.0) on the Internet; sharing, as well as remixing, of the tool is encouraged by Canvas, provided attribution is given.

The checklist can be used with new and mature courses, and is primarily useful to Canvas users since many of its features are Canvas-centric. It is comprised of four sections (course information, course content, assessment of student learning, and course accessibility) and 33 criteria (compared to the average national/statewide evaluation instrument of over six sections, and 56 criteria). The CCEC uses the rating scale of expected, best practice, and exemplary to rank the importance of the design components. The CCEC indicates 19 expected and standard design components, seven best practices/added value design components, and seven exemplary/elevated learning design components (Table 3).

Table 3

Characteristics of Canvas Course Evaluation Checklist

Canvas course evaluation checklist	
Intended usage	National
Started	2018
Current version	2018
Audience	Canvas LMS users (K-Higher Education)
New or mature	New and mature courses
Purpose	To elevate the quality of Canvas courses
Format	Checklist
Rating scale	Expected, Best Practice, Exemplary
Weights and values	"A ★ rating indicates an expected and standard design component to online learning; a ★★ rating is considered 'Best Practice' and adds value to a course; and ★★★ is exemplary and elevates learning."
Number of categories	4
Categories	Course Information, Course Content, Assessment of Learning, Course Accessibility
Subcategories	0
Number of criteria	33
Cost	Free
Availability	Creative Commons
Official review	No
Training required	No

Comparing the CCEC to Other Evaluation Instruments

In Baldwin et al.'s (2018) article comparing national and statewide evaluation instruments, 12 universal criteria were included in all of the instruments:

- Objectives are available.
- Navigation is intuitive.
- Technology is used to promote learner engagement/facilitate learning.

- Student-to-student interaction is supported.
- Communication and activities are used to build community.
- Instructor contact information is stated.
- Expectations regarding quality of communication/participation are provided.
- Assessment rubrics for graded assignments are provided.
- Assessments align with objectives.
- Links to institutional services are provided.
- Course has accommodations for disabilities.
- Course policies are stated for behavior expectations. (p. 52-53)

The CCEC indicates each of these criteria, with the following exceptions: *Technology is used to promote learner engagement/facilitate learning*, *Links to institutional services are provided*, and *Course policies are stated for behavior*.

Nine criteria were previously identified in five out of six national and statewide evaluation instruments:

- Learners are able to give feedback on the course for improvement.
- Course activities promote achievement of objectives.
- Instructor response time is stated.
- Collaborative activities support content and active learning.
- Self-assessment options are provided.
- Assessments occur frequently throughout course.
- Instructions are written clearly.
- Guidelines for multimedia are available.
- Guidelines for technology are available. (Baldwin et al., 2018, p. 54)

The CCEC includes three of these criteria (*Instructions are clearly written, Guidelines for multimedia are available, and Guidelines for technology are available*) but not the other six (*Learners are able to leave feedback, Course activities promote achievement of objectives, Instructor response time is stated, Collaborative activities support content and active learning, Self-assessment options are provided, and Assessments occur frequently throughout course*). The standard found on four out of six national and

statewide evaluation instruments, "Information is chunked" (Baldwin et al., 2018, p. 54), was also found on the CCEC. When comparing the CCEC to other national and statewide evaluation instruments, some criteria are subtly different. For example, the CCEC focuses on having a variety of assessments throughout the course, whereas other instruments focus on the frequency of assessments in the course. The Blackboard Exemplary Course Program Rubric states, "Assessment activities occur frequently throughout the duration of the course" (Blackboard, 2017, p. 7).

Unique Features of the CCEC

The CCEC is visionary in some aspects. The CCEC is an easy to use checklist, complete with checkboxes. While checklists have been identified as useful screening devices for evaluating online course design (Baldwin & Ching, 2019; Herrington, Herrington, Oliver, Stoney, & Willis, 2001; Hosie, Schibeci, & Backhaus, 2005), the other established course evaluation tools are in the form of rubrics. Also, the CCEC is relatively short. It is four pages (including citations), compared to an average of 10.71 pages for other evaluation instruments. And, it was released through a Canvas Community discussion page, where conversations between the checklist creators and users occur. This is likely to lead to further discussion about the importance of course quality. In addition, the CCEC instructs users on how to design their courses (e.g., "Home Page provides a visual representation of course; a brief course description or introduction..." "Home Page utilizes a course banner with imagery that is relevant to subject/course materials" (Instructure, 2018b, p. 1)). In contrast, other evaluation tools provide more general information such as, "A logical, consistent, and uncluttered layout is established" (SUNY, 2018, p. 2).

The CCEC has a unique focus on UDL, with 25 of the 33 criteria referenced to the UDL guidelines. UDL guidelines provide a set of principles that offer multiple means of representation, action and expression, and engagement to provide all individuals equal opportunities to learn (CAST, 2019). The concept of UDL is to create education that accommodates the widest number of learners, including those with disabilities, without the need for adaptations or special design (Rose & Meyer, 2002). UDL is used to support the variability and diversity of learners (CAST, 2019; Rose, Gravel, & Gordon, 2013) by how information is presented, how learners express what they learn, and how learners engage in learning (Hall, Strangman, & Meyer, 2014).

Four of the CCEC exemplary design components are linked to personalized learning ("Personalized learning is evident", "Differentiation is evident (e.g. utilized different due dates)," "MasteryPaths are included," and "Learning Mastery Gradebook is enabled for visual representation of Outcome mastery" (Instructure, 2018b, p. 2)). Personalized learning is defined as developing learning strategies and regulating learning pace to address individual student's distinct learning needs, goals, interests, or cultural backgrounds (iNACOL, 2016). Personalized learning has become increasingly popular with the advent of more affordable and available software. Technology can be used to develop learner profiles, track progress, and offer individualized feedback. With both personalized learning and UDL, educators are encouraged to understand learner variability, use multiple instructional delivery and assessment methods, and encourage student engagement (Gordon, 2015; McClaskey, 2017).

Interaction is emphasized (e.g., as a separate category) in all of the previously reviewed state and national evaluation instruments (Baldwin et al., 2018). In contrast, the CCEC instructs course designers to include at least one of three forms [of interaction]:

- Student-Student Interaction (e.g., discussions and/or collaborative projects).
- Student-Teacher Interaction (e.g., quality feedback).
- Student-Content Interaction (e.g., engaging content and resources with which students must interact and not just read or watch. (Instructure, 2018b, p. 2)

While these three forms of interaction are individually significant, Moore (1989) instructed educators of the vital importance of including all three forms of interaction in distance education in his perennially cited editorial.

Unlike established instruments like Quality Matters (QM) or the Blackboard Exemplary Course Program Rubric, the CCEC does not have an official review process or certification outcome. No training is required to use the CCEC, but like the Open SUNY Course Quality Review Rubric (OSCQR), the CCEC supplies the user links to explain some of its criteria (e.g., "Canvas Guide- Add Image to Course Card" [Instructure, 2018b, p. 1]).

The CCEC is based on research that is different than the research cited by other well-known national and statewide evaluation instruments. The CCEC cites the UDL guidelines, a K-12 quality course checklist, and an online course best practices checklist from a California community college. In contrast, OSCQR provides research-based evidence for each of its criteria. Likewise, the QM Rubric is supported by an intensive review of literature involving 21 peer-reviewed journals conducted by an experienced staff (Shattuck, 2013). The CCEC is generally grounded in the UDL framework, while other instruments are grounded in a more comprehensive synthesis of research-based pedagogical practices.

Conclusion

Providing a short, easy-to-use checklist that provides specific guidelines for designing an online course and promotes personalization and accessibility is beneficial to Canvas users. The LMS influences the design and pedagogy of online courses (Vai & Sosulski, 2016). However, while the CCEC is innovative in some aspects, this review shows it falls short on evaluating other critical aspects of online design (e.g., interaction). Introducing an easy-to-use evaluation checklist that neglects previously identified research-based practices (established by six other national and statewide evaluation instruments) to potentially a third of higher education online course instructors/designers is disconcerting. It is suggested that the CCEC be revised to include the identified practices to better support Canvas LMS users.

It is critical to support instructors and course designers with guidelines based on best practices to encourage quality course design. Currently, the CCEC may serve as a good starting point for online course designers who wish to use an evaluation instrument to improve course quality. However, we highly recommend that

instructors and course designers consult other national and statewide online course evaluation instruments that offer guidance based on more comprehensive research-based practices to supplement the CCEC in their quest to design quality online courses.

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